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VOL. X NOVEMBER, 1915 No. 6

STUDIES IN PHILIPPINE JASSOIDEA, IV: THE IDIOCERINI OF THE PHILIPPINES

By C. F. BAKER
(*From the College of Agriculture, University of the Philippines, Los Baños, P. I.*)

TWENTY-THREE TEXT FIGURES

The Jassoidea of the subfamily Bythoscopinæ are surprisingly well represented in the Philippines, especially in the tribe Idiocerini. They include some economically very important insects. Two of the species are controlling factors in the fruiting of mangoes in many parts of these Islands, and the life histories of these need careful investigation, looking toward methods of control. The benefit that the Filipinos ascribe to the smudging of the trees at the time of flowering comes through the driving out of the swarms of these injurious insects, which frequent the flower clusters.

Taxonomic work in these groups is exceedingly difficult. All of the oriental species in the Idiocerini would have been referred without question to *Idiocerus* twenty years ago. No one would have thought of separating "genera" out of so homogeneous a group. However, Distant has separated three critical genera without fully diagnosing them, and Kirkaldy separated two—one critically separated group, and one very well marked. In continuing the study of oriental material, there are two alternatives—to make all of the genera described by Distant and one described by Kirkaldy subgenera of *Idiocerus*, or to follow their lead to its logical conclusion and separate a number of additional coördinate groups as genera. The latter course is followed in this paper, although the entire subject will have to be reviewed and readjusted in connection with extensive European, African, and American material. This will leave entomologists to their own inclinations as to whether they dub these groups genera or subgenera.

It is doubtful if any of the species under *Idiocerus* in the Fauna of British India are typical *Idiocerus*, and it is impossible from the meager descriptions there given properly to refer all of them. *Idiocerus niveosparsus* is apparently a *Chunra*, *I. clypealis* is an *Idioscopus*, and *I. unimaculatus* is apparently a *Pedioscopus*. The remainder of the species there described appear, from the color descriptions, to be different from anything known to me in the Philippines.

The structure and sculpturing of head, the proportions of head, pronotum, and scutellum, the venation of tegmina, the sculpturing of scutellum, and the form of genitalia must be fully described or figured for these species, or their certain identification will be impossible. Some of the species are remarkably similar in coloration, and some are very variably colored. Some of the species show a remarkable sexual dimorphism in colors, particularly on the face, to which I have called attention in the following descriptions.

There are few single characters which could be used for safe generic separation in the Idiocerini, since most of the characters are subject to more or less variation or even lapse in abnormal cases. The average condition must be used, and the general habitus and general census of characters must be constantly considered. The habitus does not always lend itself to clear description, but is readily appreciable in figures or specimens. The following synopses are not comprehensive and are intended only to show the relationships of the forms occurring in the oriental fauna.

BYTHOSCOPINÆ

Synopsis of the tribes.

a[1]. Tegmina with an appendix (usually very large); pronotum with a very narrow connection with propleuræ, or a visible connection lacking; head usually wider than pronotum, rarely not as wide or only as wide. Idiocerini.

a[2]. Tegmina usually without a distinct appendix, or, if with a very small and narrow one, then vertex usually considerably longer at middle than at sides; pronotum usually broadly connected with propleuræ, a carina usually separating the two.

b[1]. Head about as wide as, or wider than, pronotum; as seen from above often strongly angulate; face about as long as wide or longer; supra-antennal ledges usually very weak; the scrobes usually shallow .... Agalliini.

b[2]. Head usually distinctly narrower than pronotum; as seen from above usually very broadly rounded; face wider than long; supra-antennal ledges very strong; antennal scrobes deep.......... Bythoscopini.

IDIOCERINI

Diagnostic synopsis of the genera.

*a*¹. Head very short and much wider than the very short and very broad pronotum; vertex shorter at middle than at eyes, where its anterior margin is strongly sinuate; face with width once and a half the length, front far wider than long; supra-antennal ledge falling far short of reaching eye; clypeus parallel-sided; tegmina very broad; first anteapical cell confluent with median, the second being the only closed anteapical; closed apical cells five, but with supernumerary subobsolete cells in apical portion of costal area.................... Ipo Kirk.

*a*². Head, etc., not as above.

- *b*¹. Scutellum, and clypeus at least in part, more or less tumidly elevated; upper lateral sutures of the front usually strong to the ocelli; loræ acute above; scutellum very large, distinctly longer than head and pronotum together.
  - *c*¹. Head as wide as pronotum; appendix scarcely reaching apex of corium, and about as wide as second apical cell; vertex shagreened and slightly shorter at middle than at eyes; venation indistinct proximad of apical cross veins; first apical cell twice the width of fourth, which is far shorter than third; pronotum two and a half times as wide as long, its hind margin very slightly incurved; loræ shorter than clypeus and lying in same plane as genæ; supra-antennal ridge strongly sinuate, producing a distinct lobe next front; clypeus broader at base than at apex .... Iposcopus gen. nov.
  - *c*². Head usually wider than pronotum; vertex as long at middle as at eyes or longer; venation usually strong proximad of apical cross veins; outer apical cell in tegmina separated from outer subapical by a cross vein, thus three subapical cells; first apical cell about same width as fourth, which is about same length as third; pronotum less than two and a half times as wide as long, its hind margin strongly incurved; loræ longer than clypeus; supra-antennal ledge evenly curved, not producing a lobe next front; clypeus usually distinctly broader at apex than at base.
    - *d*¹. Five apical cells in tegmina; first subapical cell about as large as second or as third; appendix scarcely reaching apex of corium and about as wide as second apical cell; head finely shagreened; loræ lying in same plane as genæ; frontoclypeal suture distinct............................ Ipocerus gen. nov.
    - *d*². Four apical cells in tegmina; first subapical cell much smaller than second or than third; appendix surrounding apex of corium and wider than second apical cell; vertex and upper part of face cross striate; loræ tumidly elevated; fronto-clypeal suture obsolete .... Chunra Dist.
- *b*². Scutellum and clypeus not at all tumidly swollen; upper lateral sutures of front usually not equally distinct near ocelli and near scrobe; scutellum of medium size, rarely as long as, usually distinctly shorter than, pronotum and vertex together.
  - *c*¹. Outer apical cell in tegmina separated from outer subapical by a cross vein, thus three subapical cells; vertex normally transversely wrinkled, usually very short and very broad; clypeus usually with

sides strongly incurved and suddenly and strongly broadened apically .... **Idiocerus** Lewis.

c^2. Outer apical cell in tegmina continuous with the outer subapical, the cross vein lacking (always to be examined by transmitted light), thus never more than two closed subapical cells; vertex usually longer at middle than next eyes, and very long for this group, in proportion to width between eyes.
  d^1. Upper lateral sutures of front obsolete, the lower lateral sutures continuous with the supra-antennal ridges, the front thus very broadly open above; ocelli nearer to eyes than to median line, or as near .... **Busonia** Dist.
  d^2. Upper lateral sutures of front distinct, always distant more than half the distance from supra-antennal ridges to ocelli; ocelli rarely much nearer to eyes than to median line of face.
    e^1. Upper lateral sutures of front each directed toward the inner margin of the ocellus of the same side or nearly so; head distinctly wider than pronotum.
      f^1. Tegmina with three apical cells and without subapicals. **Balocha** Dist.
      f^2. Tegmina with four apical cells.
        g^1. Subapical cells absent .... **Pedioscopus** Kirk.
        g^2. Subapical cells (one or two) present... **Idioscopus** gen. nov.
    e^2. Upper lateral sutures of front strongly incurved, and from near scrobes each directed toward the ocellus of the opposite side, the front thus appearing far broader than long, and with very strong lateral angles; head about as wide as pronotum; second apical cell pedunculate in present species; first apical cell much broader and shorter than fourth; ocelli nearer to median line than to eyes.. **Idiocerinus** gen. nov.

Genus IPOSCOPUS novum

Type, *Iposcopus distanti* sp. nov.

Synopsis of the species.

a^1. Cross vein at base of third apical cell antenodal; head slightly wider than pronotum; colors dark and sharply contrasted.... **distanti** sp. nov.
a^2. Cross vein at base of third apical cell postnodal; head slightly narrower than pronotum; colors pale, markings ill defined.......... **breviceps** sp. nov.

Iposcopus distanti sp. nov.

Length, 4.5 mm.; width of head, 1.8 mm. Head straw-colored with dark mottlings on upper part of face, including two irregular dark spots between ocelli and upper margin; clypeus, loræ, and lower part of cheeks blackish. Pronotum brownish, two small transverse dashes back of eyes blackish, and hind margin yellowish. Scutellum brown, with two black basal lunulæ and a broad, bright yellow transverse band back of middle; the apex brown. Mesopleuræ blackish. Tegmina brown, with a narrow transverse band near base, nearly continuous with that on scutellum, and a short tranverse commissural ivory-white mark on clavus at apex of inner claval vein; a large irregularly triangular clear area at basal third of costa, and another of same size at apical third; appendix smoky. Sternum and legs straw-colored, the fore tibiæ blackish, the middle tibiæ darkened. Abdomen yellow at base, the genitalia blackish.

Head very finely shagreened throughout, very slightly wider than pronotum; the length of vertex into width between eyes, eleven times; vertex as long at middle as at eyes. Face broader than long; ocelli nearer to eyes than to median line; front more than a fourth broader than long;[1] clypeus broader than long, apical margin slightly incurved; loræ very small, scarcely longer than clypeus, and not one half as wide. Width of pronotum two and a half times the length, nearly seven times as long as the vertex, the hind margin slightly incurved; surface finely shagreened, with remote and very shallow and irregular subobsolete transverse wrinkles and with scattering and remote darker punctures. Scutellum longer than head and thorax together; the transverse impressed line evenly but not strongly arcuate and with a small fovea anterior to each lateral extremity; median area just posterior to transverse impression, with about five sharply impressed fine transverse lines. Tegmina slightly roughened basally and with punctures along the veins; veins subobsolete basally and remainder slender. Anal segment of male medially produced and strongly longitudinally carinate; pygofers thick, apically subterete, and with a curved longitudinal carina on lower surface.

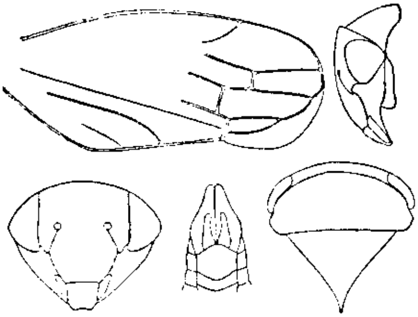

FIG. 1. *Iposcopus distanti* sp. nov.

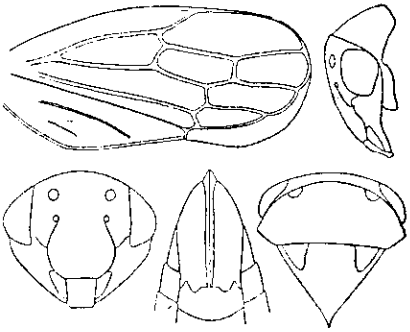

FIG. 2. *Iposcopus breviceps* sp. nov.

MINDANAO, Butuan (*coll. Baker*).

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[1] Length of front is measured from frontoclypeal suture to a line drawn between ocelli.

Iposcopus breviceps sp. nov.

Length, 5 mm.; width of head, 1.8 mm. Straw-colored with darker mottlings. Face with two small black spots midway between ocelli and upper margin, with large dark mottling on upper portion and with smaller and more sharply defined markings on lateral fields of front; apical half of clypeus, except middle of apical margin, blackish. Pronotum with small, indistinct, darker mottlings, these larger and darker near the lateral angles, and with two small round black spots on anterior margin just within eyes. Scutellum with basal blackish lunulæ, the central foveæ of middle area darkened. Tegmina semitransparent, brownish, a white dot near base of clavus and another at tip of inner claval vein; veins of corium whitish; corium with whitish mottlings near base and with the area of the large, outer apical cell clearer. Mesopleuræ black-spotted. Tibiæ darkened apically. Abdomen nearly concolorous.

Head very finely shagreened throughout, scarcely as wide as pronotum; length of vertex into width between eyes about eleven times; vertex slightly shorter at middle than at eyes. Face broader than long; ocelli equally distant from eyes and median line; front but little broader than long; clypeus about as broad as long, apical margins but slightly incurved; loræ as long as clypeus and about half as broad. Width of pronotum scarcely two and a half times the length, the length more than seven times that of the vertex; surface finely shagreened and remotely subobsoletely wrinkled and punctured. Sculpturation of scutellum as in *distanti*. Tegmina slightly roughened basally and with punctures along the veins; veins very evident basally. Anal segment of female with hind margin laterally strongly incurved; the lateral angles acutely produced, the median portion subtruncate.

MINDANAO, Butuan (*coll. Baker*).

Although this form and *I. distanti* are from the same general region, and one is represented only by males and the other only by females, I do not feel justified in placing them as the two sexes of a single species. Striking sexual dimorphism in colors is to be expected in this group, but I have yet encountered no such sexual differences in structure as are exhibited in this case.

Genus IPOCERUS novum

The form here described as the type of a new genus was at first placed in Kirkaldy's genus *Ipo*, following his description. Through the kindness of Mr. Frederick Muir I have been able to examine a specimen of *Ipo conferta* Kirk. from Queensland,

and find that the present form cannot possibly be associated with it. *Ipo* presents a structure of head, clypeus, and loræ very distinct from anything I have yet seen in the Philippine fauna. The tegmina of *Ipo* are quite unique in the Idiocerini, very short and broad, with supernumerary cells outlined in the apical portion of costal area, with the appendix short and broadly extended on to the clavus, and with the claval suture callously thickened toward the apex. The vertex of *Ipo conferta* is very remarkable, the length at eyes being twice that at middle. Neither have I seen any idiocerine insect in the Philippine fauna so large and with a head and pronotum proportionately so broad—the width of the head being 3 millimeters.

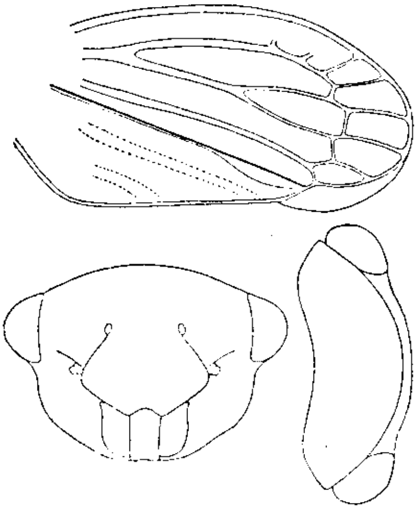

FIG. 3. *Ipo conferta* Kirk.

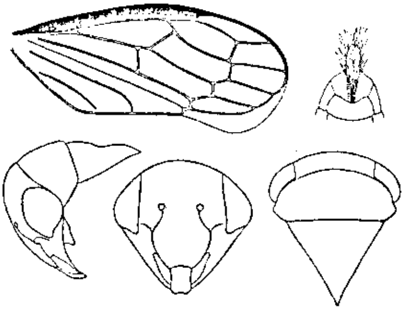

FIG. 4. *Ipocerus kirkaldyi* sp. nov.

In some respects *Ipocerus* strongly resembles *Chunra* as described and figure by Distant, but is very distinct in some characters of first importance.

Type, *Ipocerus kirkaldyi* sp. nov.

Ipocerus kirkaldyi sp. nov.

Length, 4.4 mm.; width of head, 1.8 mm. Straw-colored; head, pronotum, scutellum, and tibiæ very finely reticulately mottled with brownish. Scutellum with darker clouds at lateral angles, at basal middle, at apex, and three at area of transverse impression. The tegmina are semitransparent, tinted with pale golden brown; the veins are dark brown, and except the apical cross veins, with numerous short white interruptions of varying lengths; the costal vein with four large, rectangular white interruptions in addition to several smaller ones. Abdomen with dark incisures above, venter brownish.

Head very finely shagreened throughout, wider than pronotum, the length of vertex into width between eyes four and two-thirds times; vertex as long at middle as at eyes. Face broader than long; ocelli nearer to median line than to eyes; front about as broad as long; clypeus longer than broad, only slightly broadened apically, the apical margin incurved; loræ a third longer than clypeus and about half as wide. Width of pronotum two and a half times the length, the length about three times that of vertex, the hind margin slightly incurved; surface finely shagreened, medially and on posterior half with rather conspicuous but remote dark punctures. Scutellum about a fourth longer than head and pronotum together, the transverse impressed line strongly angulately bent, the surface posterior to this without transverse wrinkles. Tegmina smooth, shining, and rather thin, with a few punctures along the claval veins; veins strong throughout, the costa conspicuously thickened. Anal segment of female with hind margin truncate or slightly incurved; pygofers long, very slender, and strongly haired, far longer than the lateral plates.

PALAWAN, Puerto Princesa (*coll. Baker*).

Genus CHUNRA Distant

The genus *Chunra,* as described by Distant,[2] is a taxonomic puzzle. The diagnosis is not at all diagnostic, most of the characters mentioned being tribal characters. The pronotum is stated to be "twice as long as vertex," which would be a marked character if true, but the figure shows it three times.

There occur abundantly in the Philippines, as in other Malayan and Indian countries, species of idiocerine insects, swarms of which attack the flowers of mangoes, as is recorded by Distant for the species *niveosparsus* of Lethierry. Distant's figure of *niveosparsus* shows a strong and continuous suprafrontal carina, which seems to be certainly an error, as does also the form of the clypeus. In the species, as it occurs here, the frontoclypeal suture is quite obsolete. Distant's figure shows the ocelli nearer to eyes than to each other, while he describes the genus *Chunra* as having them about as near. In the forms of *niveosparsus* occurring in the Philippines this varies considerably, as I shall show. Indeed, *niveosparsus,* as figured by Distant, fits his description of the genus *Chunra* about as well as does his type as figured. There seems to be no doubt that the common mango insects here are forms of *niveosparsus*, and after an extended study of large series of them, I cannot but refer them to *Chunra*, amplifying Distant's description of *Chunra* enough to give it generic standing as compared with *Balocha* and *Busonia*. This, of course, cannot be made final without a careful examination of the structural characters of *puncticosta* Wlk., the type of the genus.

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[2] Fauna Brit. Ind.—Rhynch. (1907), 4, 185.

The Philippine forms of *niveosparsus* present wide variations in color of scutellum, as mentioned by Distant for Indian forms, though the general plan of coloration is the same. Three lots of specimens taken at separated points in the Philippines show divergences in coloration and in minor structural characters, and it seems probable that numerous other local forms will be found. Most of the characters used below are variable within narrow limits, averaging as described.

Synopsis of the Philippine varieties of Chunra niveosparsa Leth.

a^1. Length of vertex into width between eyes more than six times; first apical cell of tegmina two fifths the length of second.
  b^1. Distance between ocelli much more than half the width of front; transverse impression of scutellum acutely bent. philippinensis var. nov.
  b^2. Distance between ocelli one half the width of front; transverse impression of scutellum obtusely bent.................. palawanensis var. nov.
a^2. Length of vertex into width between eyes less than six times; first apical cell of tegmina about a fifth the length of second; transverse impression of scutellum acutely bent........................ lagunensis var. nov.

Chunra niveosparsa Leth. var. **philippinensis** var. nov.

The variety *philippinensis* differs from typical *niveosparsus*, as described and figured by Distant, as follows: Median basal spot of scutellum always long, narrow, triangular, sometimes obsolete; apex of clavus shining white-spotted; two small, round, submedian spots in posterior field of scutellum.

The following structural characters may be added: Vertex, and face as far as ocelli, thickly arcuately cross striate. Head wider than pronotum, the length of vertex into width between eyes somewhat more than six times; vertex about as long at middle as at eyes. Face about as broad as long; ocelli nearer to median line than to eyes, the distance between ocelli being about the width of an ocellus more than the distance from eye to ocellus; distance between ocelli more than half the width of front; clypeus several times longer than broad, greatly narrowed centrally, the apical margin incurved; loræ longer than clypeus and twice its breadth at middle. Width of pronotum about two and one-fourth times its length, its length a little more than four times that of the vertex, the hind margin slightly incurved; surface thickly, evenly shagreened. Scutellum longer than head and thorax together; basal field, except lateral margin, shagreened; apical field, except calloused lateral margins, transversely wrinkled, as are also the submargins of basal field; transverse impressed line strongly, angularly bent, open at apex of angle, the lateral limbs arcuate, the space between them transversely wrinkled. Last ventral segment of female very short, its hind margin subtruncate to slightly sinuate. Hind margin of anal segment of male strongly sinuate, the lateral portions sloping, the median strongly obtuse-angularly produced.

LAGUNA, Los Baños (*coll. Baker*).

Occurring in swarms on mango flowers.

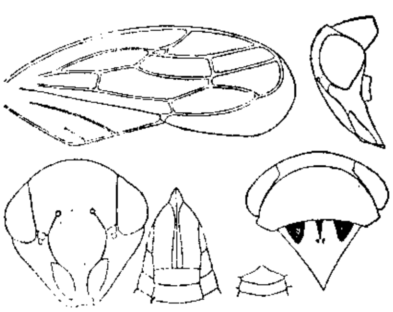

FIG. 5. *Chunra niveosparsa* Leth. var. *lagunensis* var. nov.

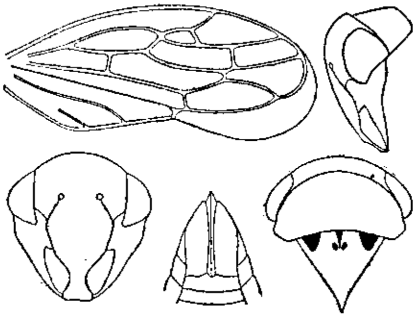

FIG. 6. *Chunra niveosparsa* Leth. var. *palawanensis* var. nov.

Chunra niveosparsa Leth. var. palawanensis var. nov.

This variety differs from var. *philippinensis* as follows: Distance between ocelli one half of width of front; clypeus somewhat shorter and broader; loræ longer than clypeus, but not twice its breadth at middle; scutellum with transverse impressed line very obtuse-angularly bent, the lateral limbs scarcely arcuate. Hind margin of anal segment of female more strongly sinuate, medially strongly notched.

PALAWAN, Puerto Princesa (*coll. Baker*).

Chunra niveosparsa Leth. var. lagunensis var. nov.

This variety differs from var. *philippinensis* as follows: Length of vertex at middle into width between eyes less than six times; distance between ocelli about half the width of front; loræ less than twice the width of clypeus; hind margin of anal segment of female truncate.

LAGUNA, Pagsanjan (*coll. Baker*).

Genus BUSONIA Distant

The enlarged first apical cell of the tegmina is not at all diagnostic for this genus, as used by Distant, since it occurs in some other genera—in all degrees in *Pedioscopus.* Well shown in the figure of the type, but not mentioned in the genus characterization, however, is a unique character which well distinguishes this genus—the absence of upper lateral sutures of front, the lower lateral margins being continuous with the supra-antennal ridges. *Idiocerus minor* of Bierman [3] from Semarang, Java, belongs here, as may be seen at once from the figure of the type. Two very inconspicuous species have been encountered in the Philippines, which are, however, remarkably distinct in their structural characters.

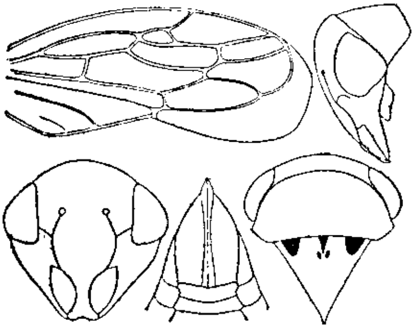

FIG. 7. *Chunra niveosparsa* Leth. var. *philippinensis* var. nov.

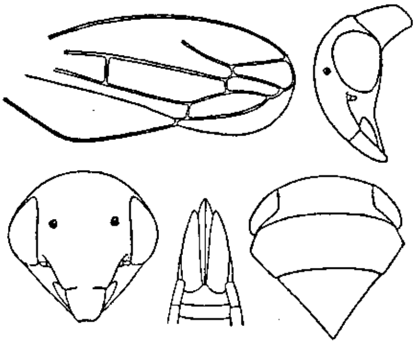

FIG. 8. *Busonia scutellaris* sp. nov.

Synopsis of Philippine species of Busonia.

a^1. Clypeus very broad, convex-sided, and rounded at tip; ocelli nearer to eyes than to median line; cross vein at base of first apical cell and venation proximad of this, obsolete; no subapical cells; the second apical cell broader at apex than at base, the third broader at base than at apex, and the fourth far longer than third; clavus not punctate .... scutellaris sp. nov.

a^2. Clypeus narrow, concave-sided, and emarginate at tip; ocelli as near median line as to eyes; venation all distinct; one subapical cell; the second apical cell as broad at apex as at base, the third broader at apex than at base, and the fourth as long as third; clavus with very large dotted punctures.. mindanaensis sp. nov.

Busonia scutellaris sp. nov.

Length, 3.5 mm.; width of head, 1.3 mm. Color pale brown with a leaden cast on the pronotum; color of front shading into black on the clypeus (and with minute black spots at ocelli), loræ, and margins of cheeks; apical half of scutellum, legs, meso- and metapleuræ with their sterna, and abdomen, except dorsal disk and genitalia, yellow; hind femora brownish toward tips. Tegmina pale brownish, the costal margin, as far as apical cell, blackish (with a narrow extension along base of first apical cell), the apical margin and appendix smoky, the region of outer apical cell semitransparent.

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[3] *Notes Leyden Mus.* (1907), 29, 165.

Head finely shagreened throughout, about equaling pronotum in width, length of vertex into width between eyes two and a half times, vertex distinctly longer at middle than at eyes. Face about as broad as long; ocelli nearer to eyes than to median line; distance between ocelli once and a half the width of clypeus at base; supra-antennal ridges not reaching eyes; frontoclypeal suture obsolete at middle; clypeus very broad at base, gradually narrowed to the somewhat emarginate apex; loræ small, nearly as long as clypeus, but scarcely more than a fifth the width. Width of pronotum two and three-fourths times the length, the length once and a half that of the vertex, anterior and posterior margins subparallel and very gently curved; surface finely, evenly shagreened. Scutellum as long as pronotum and about one half of vertex together; the transverse impressed line strongly, angularly bent, the surface distinctly shagreened only on areas of basal lunulæ, posterior area medially finely carinate. Tegmina impunctate, smooth; radial and claval veins subobsolete; third apical cell narrowed to apex. Hind margin of anal segment of female strongly, medially produced.

MINDANAO, Butuan (*coll. Baker*).

This species closely resembles *B. amentata* Dist. in coloration, but that species is described as having pronotum only slightly longer than vertex, the face yellowish toward apex instead of black, and the figure shows no extension of costal black on tegmina along base of first apical cell. Distant states that the color markings in Indian specimens are very constant.

Busonia mindanaensis sp. nov.

Length, 3.3 mm.; width of head, 1 mm. Ochraceous, genæ below antennæ to loræ black; scutellum brownish; meso- and metapleuræ black; legs very pale straw color; tegmina washed with pale golden brown, the costa basally dark brown to blackish, this color narrowly extended along base of first apical cell; a smoky area in apex of second apical cell, region of first apical cell clearer than elsewhere. Abdomen yellowish, dorsal disk blackish; last ventral segment and ovipositor brownish.

Vertex and upper part of face finely, transversely striate;

genæ with very coarse, oblique wrinkles between antennæ and outer margin; remainder of face finely shagreened. Head distinctly wider than pronotum; length of vertex into width between eyes little less than four times, its length at middle slightly more than at eyes. Face slightly broader than long, ocelli about as near to median line as to eyes; distance between ocelli two and a half times the width of clypeus at base; supra-antennal ridges reaching eyes; frontoclypeal suture distinct; clypeus small, narrow, broader at apex than at base, slightly emarginate at apex; loræ small but broad, more than half the width of clypeus. Width of pronotum two and one-fourth times the length, the length two and a half times that of vertex; anterior margin distinctly more strongly arcuate than posterior; surface coarsely shagreened. Scutellum as long as pronotum and one third of vertex together, entire surface of anterior field coarsely shagreened, posterior field minutely, transversely rugose; transverse impressed line slightly bent at middle, the lateral extremities transverse. Tegmina very coarsely thimble-pitted along the veins, these pits much more numerous and conspicuous on clavus and base of corium where they are centrally pimpled. Veins more distinct than in *B. scutellaris*, the third apical cell broadened apically. Last ventral segment and pygofers of female pale brown, and ovipositor dark brown, in striking contrast to color of remainder of venter. Hind margin of anal segment of female subtruncate.

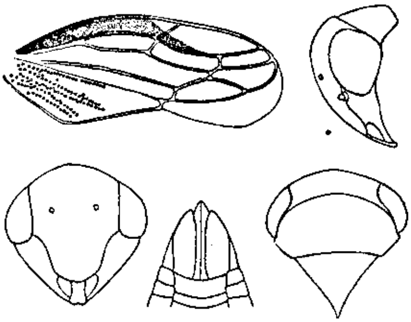

FIG. 9. *Busonia mindanaensis* sp. nov.

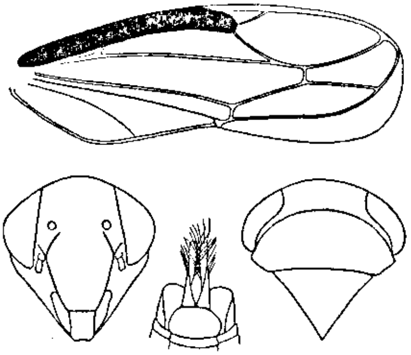

FIG. 10. *Balocha busonioides* sp. nov.

MINDANAO, Iligan (*coll. Baker*).

These two species illustrate, at its best, the remarkable divergence in structural characters among some of these idiocerine insects, in spite of the unusual homogeneity in general habitus.

Genus BALOCHA Distant

The genus *Balocha* represents an extreme reduction in the venation of the tegmina, this being the only character of possibly generic value mentioned by Distant. I believe that the type should be reëxamined as to the exact form of the front, since the figure of the type shows a condition in the upper lateral sutures that is certainly open to question. The Philippine species placed here would be classified under *Busonia* in Distant's synopsis, and even resembles *Busonia* in color plan, but the facial characters in *Busonia* are unmistakable.

Balocha busonioides sp. nov.

Length, 4 mm.; width of head, 1.3 mm. Color sordid ochraceous above, very pale straw color below; head with two adjoining dark clouds on upper part of face, small black spots next ocelli, and dark clouds between ocelli and eyes; an indistinct and very oblique craticulum on front; pronotum olive-tinted; basal area of scutellum brownish; tegmina semitransparent with brown veins, tinted with golden brown, darker basally, costa broadly dark brown or black as far as the first apical cell; clavus with a narrow yellowish stripe lying next basal half of commissure; abdomen with more or less of dorsum and side plates of genitalia dark-colored; mesopleuræ with black spots.

Head and pronotum shagreened throughout, this shagreening somewhat transverse on vertex. Head distinctly wider than pronotum; length of vertex into width between eyes two and three-fourths times, its length at middle slightly greater than that at eyes. Face distinctly longer than broad; ocelli nearer to eyes than to median line; distance between ocelli nearly twice the width of clypeus at base; length of front once and a fourth the width; clypeus small, short, about as broad at apex as at base, tip emarginate; loræ longer than clypeus and about half as wide. Width of pronotum two and a half times the length, the length two times that of vertex; anterior margin slightly arcuated, posterior margin nearly straight. Scutellum as long as pronotum and one third of vertex together; surface evenly shagreened throughout; transverse impressed line strong, obtuse-angularly bent, apex widely open, the lateral limbs straight. Tegmina smooth, thin, with a few very minute punctures on clavus, which has only one evident discal vein. Hind margin of anal segment of male strongly rounded at sides, truncate medially; pygofers very slender, thin, twisted, and long-haired.

LUZON, Mount Maquiling (*coll. Baker*).

Genus **PEDIOSCOPUS** Kirkaldy

Following Kirkaldy's description, I had temporarily placed a number of Philippine insects in the genus *Pedioscopus*. A later comparison with specimens of *P. agenor* Kirk. (see figure) kindly sent to me by Mr. Frederick Muir, of the Hawaiian Sugar Planter's Association, makes this reference certain, and enables me to show that this genus is extensively represented in this Archipelago. It includes some of our most highly colored members of the family.

Synopsis of the Philippine species of Pedioscopus.

- *a*¹. Vertex transversely wrinkled; second apical cell in tegmina not pedunculate; sides of front strongly angled below antennæ; head in female with four large, round black spots (lacking in male), and pronotum with two round black spots........................ **disjunctus** sp. nov.
- *a*². Vertex shagreened; sides of front not strongly angled below antennæ.
  - *b*¹. Pronotum far more than two times as long as vertex; length of vertex into width between eyes more than four times; second apical cell of tegmina not pedunculate; scutellum as long as pronotum and vertex together.
    - *c*¹. Loræ longer than clypeus; color yellowish ochraceous; length 3.5 mm .... **modestus** sp. nov.
    - *c*². Loræ shorter than clypeus; color brownish ochraceous; length 5.3 mm.. **maquilingensis** sp. nov.
  - *b*². Pronotum distinctly less than two times as long as vertex; length of vertex into width between eyes little more or less than two times; second apical cell of tegmina pedunculate; scutellum shorter than vertex and pronotum together.
    - *c*¹. First apical cell about as broad as fourth, normal basally, not touching median vein subapically; ocelli nearer eyes than to median line.
      - *d*¹. Tegmina without black costa or apical black spot; clypeus white at extreme apex in female; hind margin of anal segment of female very slightly and broadly produced .... **similis** sp. nov.
      - *d*². Tegmina with black costa and apical black spot; clypeus all black in female; hind margin of anal segment in female suddenly strongly produced to an emarginate apex. **angustatus** sp. nov.
    - *c*². First apical cell far broader than fourth, basally abnormal, broadly extended on to median vein subapically; ocelli as near to median line as to eyes.
      - *d*¹. Clavus all yellow, with a median, longitudinal black stripe. **simplex** sp. nov.
      - *d*². Clavus with basal half yellow, and wanting black stripe, sometimes part ivory-white or red-brown........... **coloratus** sp. nov.

Pedioscopus disjunctus sp. nov.

Length, 3.75 mm.; width of head, 1.25 mm. Ochraceous, in the female with black as follows: Two large, round spots on pronotum, two on apex of head, two just within ocelli, apical margin of front, all of clypeus, and most of loræ and ovipositor; head in male lacking black. Tegmina with basal two thirds of costal vein, and a broad stripe along median vein as far as cross veins, black; corium within the black stripe, and all of clavus except commissure, opaque yellow; between the black stripe and costa, and the region of the apical cells, semitransparent.

Vertex, and face as far as ocelli, finely, transversely wrinkled, genæ coarsely but shallowly, obliquely wrinkled, remainder of face shagreened; head wider than pronotum; length of vertex into width between eyes little more than three times; length at middle distinctly greater than at eyes. Face about as broad as long, distance between ocelli more than three times the distance between ocelli and eyes, and more than three times the width of clypeus at base; front slightly broader than long; clypeus broadened apically, and apical margin slightly emarginate; loræ as long as clypeus, and nearly as wide as clypeus at base. Width of pronotum two and a fourth times the length, the length two times that of vertex. Surface of pronotum and anterior field of scutellum very finely subobsoletely shagreened. Scutellum as long as pronotum and about a third of the vertex together; transverse impressed line short, straight; posterior field shallowly, transversely wrinkled. Tegmina with very minute, scattering, dark punctures along the claval veins; veins of corium subobsolete basally; second apical cell sessile. Hind margin of anal segment of female medially long and narrowly produced; pygofers slender and long-haired.

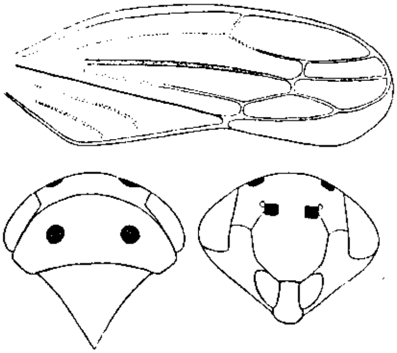
FIG. 11. *Pedioscopus agenor* Kirk.

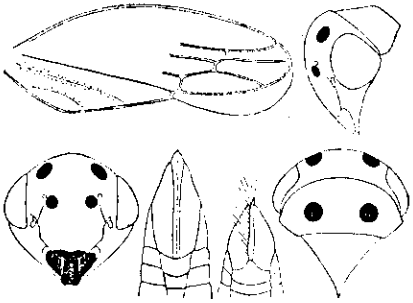
FIG. 12. *Pedioscopus disjunctus* sp. nov.

LUZON, Los Baños and Mount Maquiling (*coll. Baker*).

This species is close to *P. agenor* Kirk. in markings as well as in structure of tegmina.

Pediosocopus modestus sp. nov.

Length, 3.5 mm.; width of head, 1.3 mm. Color ochraceous, pronotum slightly darker, mesopleuræ black-spotted, abdomen more or less dark-colored at base and above, last ventral segment in male brown, hind tibiæ with large black spots at bases of spines, the second tarsal joint apically brown; tegmina washed with very pale brownish, nearly uniform throughout.

Head finely shagreened throughout, wider than pronotum; length of vertex into width between eyes more than four times; length at middle about the same as at eyes. Face a little longer than broad; distance between ocelli three times the distance between ocelli and eyes and once and a half the width of the clypeus at base; front about as broad as long; clypeus very broad, nearly as broad at base as at apex, the tip emarginate; loræ longer than clypeus but not one half as broad. Width of pronotum two and one-third times the length, length slightly more than three times that of vertex. Surface of pronotum and scutellum finely shagreened. Scutellum about as long as head and pronotum together; transverse impressed line evenly and gently arcuate. Tegmina with a few, remote, shallow punctures on clavus; second apical cell sessile. Hind margin of last ventral segment of female broadly long-produced medially, the side plates angled apically; hind margin of anal segment of male truncate.

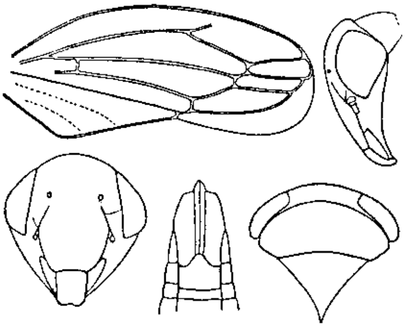

FIG. 13. *Pediosocopus modestus* sp. nov.

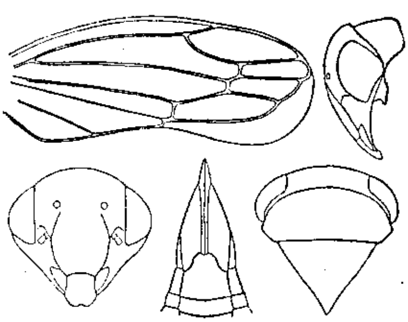

FIG. 14. *Pediosocopus maquilingensis* sp. nov.

MINDANAO, Butuan (*coll. Baker*).

A very common species, but very inconspicuous.

Pediosocopus maquilingensis sp. nov.

Length, 5.3 mm.; width of head, 1.9 mm. Color ochraceous; the scutellum, except margins, brownish, the basal lunulæ darker, and two brown spots just anterior to lateral extremities of transverse impression; ovipositor brown. Tegmina semitransparent, washed with very pale brownish, the veins golden brown.

Head, pronotum, and scutellum finely shagreened; head wider than pronotum; length of vertex into width between eyes four times, the length at middle about the same as at eyes. Face a little longer than broad; distance between ocelli somewhat more than twice the distance between ocelli and eyes and once and a half the width of clypeus at base; front longer than broad; clypeus broad and short, a little broader apically than basally, the tip emarginate; loræ shorter than clypeus and one third as broad. Width of pronotum two and a half times the length, the length about two and a half times that of the vertex. Scutellum as long as pronotum and vertex together; transverse impressed line strongly, angularly bent, open at apex, the lateral limbs strongly arcuated. Tegmina without distinct punctures; second apical cell sessile. Hind margin of anal segment of female broadly, strongly, medially produced, the apex emarginate.

LUZON, Mount Maquiling (*coll. Baker*).

Pedioscopus maquilingensis is the largest species of the genus known in the Philippines. Peculiar to this species are the strongly curved supra-antennal ridges.

Pedioscopus similis sp. nov.

Length, 4.3 mm.; width of head, 1.3 mm. Color ochraceous, yellowish on pronotum and scutellum, basal half of clavus opaque yellow, this area distally irregularly abbreviated; corium semitransparent, faintly washed with brownish, the basal half of costa golden brown; small, round, blackened areas adjoining ocelli below; clypeus in female black, excepting the extreme tip (concolorous in male); ovipositor brown.

Head, pronotum, and scutellum finely shagreened throughout; head wider than pronotum; length of vertex into width between eyes two and one-fourth times; length at middle distinctly greater than at eyes. Face broader than long; distance between ocelli about three times the distance between ocelli and eyes and once and a third the width of clypeus at base; front about as broad as long; clypeus very broad, as wide basally as apically, the tip emarginate; loræ longer than clypeus and one third as broad. Width of pronotum three times the length, the length one and a fourth times that of the vertex. Scutellum as long as pronotum and two thirds of vertex together; transverse impressed line strongly, angularly bent, open at apex, the lateral limbs arcuate. Tegmina with a few, scattering, minute dark punctures on the opaque yellowish part of clavus; second apical cell pedunculate. Hind margin of anal segment of female longer at middle than at sides and minutely emarginate at apex; hind margin of anal segment of male very strongly rounded, the pygofers thin, straight, and long-haired.

MINDANAO, Dapitan (*coll. Baker*).

A common species at Dapitan and well marked.

Pedioscopus angustatus sp. nov.

Length, 4.5 mm.; width of head, 1.3 mm. Pale brown; small elongated spots extending from ocelli toward scrobes, and clypeus, except base (in female), black; ovipositor black; tegmina semitransparent, washed with pale brown, darker basally, the basal half of costa blackish; a spot at apex of second apical cell smoky; clavus with inner half opaque yellowish, this area reaching in an acute point to half the length of the commissure.

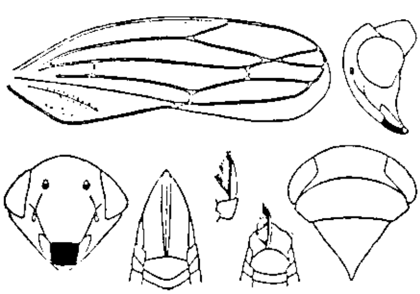

FIG. 15. *Pedioscopus similis* sp. nov.

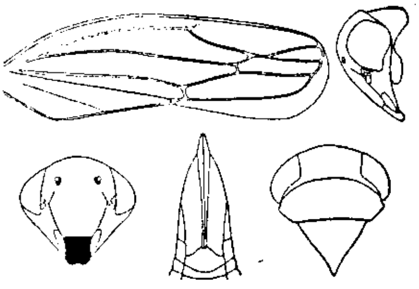

FIG. 16. *Pedioscopus angustatus* sp. nov.

Head, pronotum, and scutellum finely shagreened throughout; head broader than pronotum; length of vertex into width between eyes one and four-fifths times, length at middle distinctly greater than at eyes. Face broader than long; distance between ocelli three times the distance between ocelli and eyes and once and a third the width of the clypeus at base; front about as broad as long; clypeus very broad, little widened apically, the tip emarginate; loræ about as long as clypeus and less than a third as broad. Width of pronotum two and three-fifths times the length, the length about one and one-fourth times that of vertex. Scutellum as long as pronotum and one half of vertex together; transverse impressed line strongly, angularly bent, open at apex, the lateral limbs arcuate. Tegmina with a few, scattering, minute, dark punctures on opaque yellowish part of clavus; second apical cell pedunculate. Hind margin of anal segment of female strongly produced medially and emarginate at apex.

MINDANAO, Dapitan (*coll. Baker*).

Apparently not common. Closely related to *P. similis*.

Pedioscopus simplex sp. nov.

Length, 5.2 mm.; width of head, 1.6 mm. Color yellowish ochraceous; small basal lunulæ on scutellum, irregular spots, including the ocelli, apex of front, loræ except upper extremity, and all of clypeus (in female) black; mesopleuræ black-spotted; ovipositor black; corium semitransparent, washed with very pale brownish, clavus opaque yellow; basal two thirds of costa, a stripe along median vein extending to, and connecting with, a brownish spot in the second apical cell, brachial vein, and a longitudinal stripe passing through the clavus black.

Head, pronotum, and scutellum finely shagreened throughout; head wider than pronotum; length of vertex into width between eyes about two and one-fifth times, the length at middle distinctly greater than at eyes. Face broader than long; distance between ocelli two and a fourth times the distance between ocelli and eyes and once and a half the width of clypeus at base; front much longer than broad, clypeus very broad, broadened apically, the anterior margin only slightly incurved; loræ far longer than clypeus and about one half as broad. Width of pronotum about two and a half times the length, the length about once and two thirds that of the vertex. Scutellum as long as pronotum and a little more than half of vertex together; surface near impressed line broadly depressed, the impressed line angularly bent, apically open, the lateral limbs not arcuate. Tegmina with a few remote punctures on clavus; second apical cell long pedunculate. Hind margin of anal segment produced medially and emarginate at tip as in *P. coloratus*.

MINDANAO, Butuan (*coll. Baker*).

Pedioscopus coloratus sp. nov.

Length, 4.5 mm.; width of head, 1.3 mm. Color of head and all below ochraceous; pronotum and basal field of scutellum pale clear brown; apical field of scutellum yellowish; small, irregular, evanescent spots adjoining ocelli below, lower portion of front, clypeus (with sometimes loræ and lower portion of genæ), and ovipositor black (face concolorous in male); sides of dorsum dark brown; tegmina semitransparent, washed with very pale golden brown, darker basally, area of outer apical cell very clear, basal half of costa broadly, and the commissure, black; basal two thirds of clavus opaque yellow, often margined with ivory-white, this area posteriorly subtruncate. Extreme tip of corium often more or less smoky.

Head, pronotum, and scutellum finely shagreened throughout; head wider than pronotum; length of vertex into width between eyes two and three-fourths times, length at middle distinctly greater than at eyes. Face as long as broad; distance between ocelli three times the distance between ocelli and eyes and once and a half the width of clypeus at base; front longer than broad; clypeus of medium width, about as wide apically as basally, apex rather sharply emarginate; loræ far longer than clypeus and about one half as broad. Width of pronotum two and a half times the length, the length less than twice that of vertex. Scutellum as long as pronotum and about one half of vertex together; surface broadly depressed at impressed line, this line angulately bent, open at apex, the lateral limbs not arcuate.

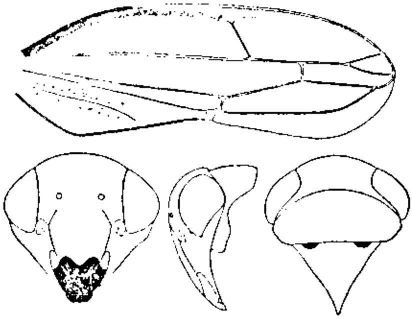

FIG. 17. *Pedioscopus simplex* sp. nov.

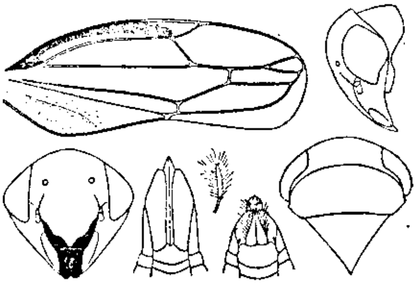

FIG. 18. *Pedioscopus coloratus* sp. nov.

Tegmina with a few, scattering, minute dark punctures on colored portion of clavus; second apical cell long pedunculate. Hind margin of last ventral segment of female long produced medially and slightly emarginate or entire at tip. Hind margin of anal segment of male sinuate, the pygofers very broad at base, narrowing to acute tips, the outer margins long-haired.

LUZON, Los Baños, Malinao; MINDANAO, Butuan (*coll. Baker*).

A common, widely distributed, and very variable species. The median vein of corium is often less darkened, and the yellow of clavus varies in intensity, sometimes being almost absent. Two very distinct varietal forms are worthy of special recognition. One of these (from Butuan, Mindanao) has very broad black commissural margins to anal portion of clavus and heavy black basal lunulæ on the scutellum. This may be designated as var. *mindanaensis* nov. The other (also from Butuan) has the anal two thirds of colored portion of clavus bright red-brown and the remainder of this area—a broad band along claval suture—ivory-white. This form may be designated var. *bicolorata* nov.

This species must be nearly related to *Idiocerus unimaculatus* Melichar, which is probably congeneric with it.

Genus IDIOSCOPUS novum

As a generic group *Idioscopus* is as distinct as *Busonia, Chunra, Pedioscopus,* etc., and I am surprised that Distant did not separate it. The habitus is not at all that of typical *Idiocerus,* the head being larger, narrower, and longer as seen from above, usually distinctly longer at middle than at eyes, and long in proportion to width between eyes. The first apical and first subapical cells are normally confluent.

Type, *Idiocerus clypealis* Leth. as here described.

Synopsis of the Philippine species of Idioscopus.

a^1. Length of pronotum about three times that of vertex; width of vertex between eyes more than four times the length; two black spots on scutellum anteriorly, two spots on anterior margin of pronotum, and two on anterior margin of head; clypeus white apically in the female .... palawanensis sp. nov.

a^2. Length of pronotum little more or less than two times that of vertex; width of vertex between eyes less than three times the length; clypeus all black in female.

  b^1. Vertex and pronotum in male without spots; scutellum with two black spots anteriorly .... clypealis Leth.

  b^2. Vertex in male with two black spots, pronotum with two spots behind anterior margin; scutellum basally with a single, large, median black spot .... tagalicus sp. nov.

Idioscopus palawanensis sp. nov.

Length, 4.25 mm.; width of head, 1.5 mm. Ochraceous, olive-tinted on vertex and pronotum; basal field of scutellum reddish brown; large basal lunulæ on scutellum, small pronotal lunulæ back of eyes, two spots on anterior margin of head, small dots inclosing ocelli, basal two thirds of clypeus, spot on mesopleuræ, and the ovipositor black; antennal scrobes darkened; tegmina golden brown, paler apically, the region of outer apical cell clearer; costa broadly, alternately yellow and brown to the outer apical cell.

Vertex, and face to just below upper black spots, finely, transversely striate, remainder shagreened; head wider than pronotum; length of vertex into width between eyes four and one-third times; length at middle nearly the same as at eyes. Face slightly longer than broad; distance between ocelli two and a half times the distance between ocelli and eyes and twice the width of clypeus at base; front slightly broader than long; clypeus of medium width, about as wide basally as apically, apex truncate; loræ much longer than clypeus and two thirds as broad. Width of pronotum two and a half times the length, the length slightly less than three times that of the vertex. Scutellum as long as pronotum and about one half of the vertex together; transverse impressed line obtuse-angularly bent, the apex open, the lateral limbs not arcuate; surface just posterior to impressed line with a few, shallow, transverse wrinkles. Tegmina distinctly thickened and roughened on basal half, this area having numerous strong punctures along the veins. Hind margin of anal segment slightly produced medially.

PALAWAN, Puerto Princesa (*coll. Baker*).

Idioscopus clypealis Leth.

Colors as described by Distant. He does not state that it is the male which lacks the two spots on anterior margin of head, this being a sexual character. The clypeus in my specimens is uniformly black. The female also possesses two small black spots between the ocelli, as shown in Distant's figure, where the ocelli, laterad of the spots, are not shown.

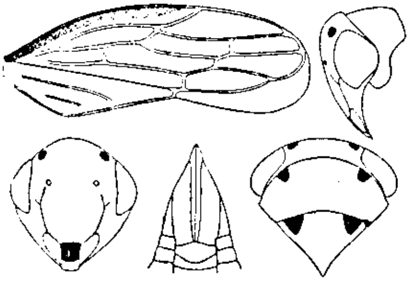

FIG. 19. *Idioscopus palawanensis* sp. nov.

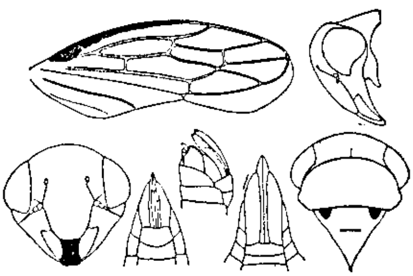

FIG. 20. *Idioscopus clypealis* Leth.

Vertex, and face to just below upper black spots, finely, transversely striate, remainder shagreened; head wider than pronotum; length of vertex into width between eyes two and one-fourth times, length at middle distinctly greater than at eyes. Face somewhat broader than long; distance between ocelli two and two-thirds times the distance between ocelli and eyes and about twice the width of clypeus at base; front longer than broad; clypeus of medium width, slightly broader apically than basally, tip gently emarginate; loræ far longer than clypeus and nearly as broad. Width of pronotum little more than twice the length, the length little more than twice that of vertex. Scutellum as long as pronotum and three fifths of the vertex together; transverse impressed line very obtusely bent, open apically, the lateral limbs not arcuate, the surface just posterior to this with a few, shallow, transverse wrinkles. Tegmina with subobsolete punctures along the veins on basal half, those on the yellowish costa minute and dark. Hind margin of anal segment of female gently bisinuate to subtruncate, in the male subtruncate. Pygofers slender at base, compressed, subspatulate.

LUZON, Los Baños (*coll Baker*). Occurring in swarms on mango flowers and probably fully as injurious as *Chunra niveosparsa.*

Idioscopus tagalicus sp. nov.

Length, 5 mm.; width of head, 1.8 mm. Ochraceous, olive-tinted on pronotum, scutellum yellow; a large, median, basal spot on scutellum, two small spots near anterior margin of pronotum (sometimes absent), two large spots on anterior margin of head, clypeus (concolorous in male), and ovipositor black; corium semitransparent, faintly tinted with brownish, more or less smoky-tipped, the middle third of costa and a broad stripe adjoining claval commissure and reaching half the length of clavus black or piceous; clavus opaque yellow; punctures along veins few and shallow on the basal half of tegmina.

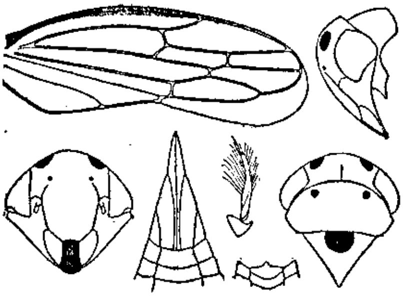
FIG. 21. *Idioscopus tagalicus* sp. nov.

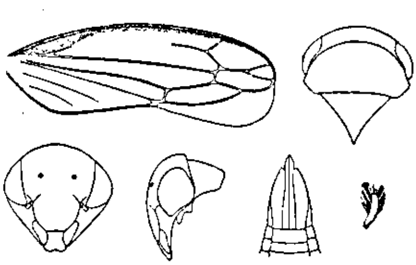
FIG. 22. *Idiocerinus melichari* sp nov.

Vertex, and face nearly to ocelli, finely, transversely striate, remainder shagreened; head wider than pronotum; length of vertex into width between eyes two and a half times, the length at middle distinctly greater than that at eyes. Face slightly broader than long; distance between ocelli two and one-third times the distance from ocelli to eyes and two and a half times the width of clypeus at base; front about as broad as long; clypeus narrowed to base, the apex suddenly broadened, the tip broadly, evenly rounded; loræ longer than clypeus and broader than clypeus at middle. Width of pronotum two and one-fourth times the length, the length a little less than two times that of the vertex, surface uniformly finely shagreened. Scutellum as long as pronotum and about one fifth of the vertex together; surface coarsely, irregularly shagreened on basal field; transverse impressed line obtuse-angularly bent, open at apex, lateral limbs not arcuate. Hind margin of anal segment of female subtruncate, in male medially, narrowly, acutely produced. Pygofers twisted, apical half uniformly narrowed.

LUZON, Mount Maquiling and Mount Banahao (*coll. Baker*).

Genus IDIOCERINUS novum

The two species here described under the new genus *Idiocerinus* present a form of front not noted by me in any other Philippine idiocerine insects. The clypeus is shorter for its width than is to be found elsewhere. Otherwise it is much more like *Idioscopus* and *Pedioscopus* than like typical *Idiocerus*. It includes the most delicately beautiful idiocerine insects in the Philippine fauna. *Idiocerus stali* of Fieber is apparently to be referred here.

Type, *Idiocerinus melichari* sp. nov.

Synopsis of the Philippine species of Idiocerinus.

*a*¹. Head and pronotum shining ochraceous, the latter and scutellum tinted with reddish brown; tegmina smoky, the veins concolorous; hind margin of anal segment of female truncate, the side plates not carinate.......... melichari sp. nov.

*a*². Head and pronotum shining pearly; tegmina subhyaline, the veins basally orange; hind margin of anal segment of female medially produced and emarginate, the side plates strongly carinate.
nacreatus sp. nov.

Idiocerinus melichari sp. nov.

Length, 4 mm.; width of head, 1.3 mm. Ochraceous, tinted with reddish brown on pronotum and scutellum. Tegmina semitransparent; corium very slightly tinted with pale brownish, only the inner veins distinct, the median vein broadly blackened throughout its length; clavus opaque golden brown; punctures obsolete.

Vertex, and face to near ocelli, sharply and strongly cross striate, the striæ on face strikingly oblique (a rare condition in the Idiocerini); length of vertex into width between eyes about five times, the length at middle very slightly greater than that at eyes. Face about as broad as long; distance between ocelli once and a half the distance between ocelli and eyes and about once and a half the width of clypeus at base; clypeus very short, broadened toward tip, where it is slightly emarginate; loræ as long as clypeus, about two thirds as wide, and with outer margin incurved. Width of pronotum two times the length, the length three and a half times that of the vertex; surface very finely shagreened. Scutellum very finely shagreened, the impressed line very inconspicuous and nearly straight; the length equaling that of pronotum; corium with second apical cell pedunculate. Hind margin of anal segment of female truncate. Pygofers of male with slender bases, gradually narrowed apically where the tip is upturned.

LUZON, Mount Maquiling (*coll. Baker*).

Idiocerinus nacreatus sp. nov.

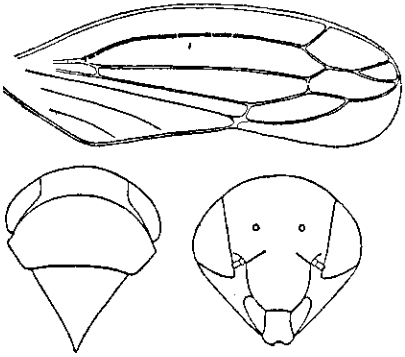

FIG. 23. *Idiocerinus nacreatus* sp. nov.

Length, 4 mm.; width of head, 1.3 mm. Head, thorax, and legs pearl white; tegmina semitransparent, with basal third washed with orange, postnodal veins orange.

Head sculptured as in *I. melichari;* length of vertex into width between eyes about three and one-third times, length at middle distinctly greater than at eyes. Face about as broad as long; distance between ocelli once and a half the distance between ocelli and eyes and once and a half the width of clypeus at base; clypeus as in *I. melichari;* loræ as long as clypeus and about two thirds the width, the outer margins not incurved. Width of pronotum two and a fourth times the length, the length two and a half times that of vertex; surface finely shagreened. Scutellum as long as pronotum and one half of vertex together, sculptured as in *melichari.* Corium with second apical cell pedunculate. Genitalia of female as in *melichari,* but side plates strongly, discally carinate.

LUZON, Mount Maquiling (*coll. Baker*).

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. *Iposcopus distanti* sp. nov.
2. *Iposcopus breviceps* sp. nov.
3. *Ipo conferta* Kirk.
4. *Ipocerus kirkaldyi* sp. nov.
5. *Chunra niveosparsa* Leth. var. *lagunensis* var. nov.
6. *Chunra niveosparsa* Leth. var. *palawanensis* var. nov.
7. *Chunra niveosparsa* Leth. var. *philippinensis* var. nov.
8. *Busonia scutellaris* sp. nov.
9. *Busonia mindanaensis* sp. nov.
10. *Balocha busonioides* sp. nov.
11. *Pedioscopus agenor* Kirk.
12. *Pedioscopus disjunctus* sp. nov.
13. *Pedioscopus modestus* sp. nov.
14. *Pedioscopus maquilingensis* sp. nov.
15. *Pedioscopus similis* sp. nov.
16. *Pedioscopus angustatus* sp. nov.
17. *Pedioscopus simplex* sp. nov.
18. *Pedioscopus coloratus* sp. nov.
19. *Idioscopus palawanensis* sp. nov.
20. *Idioscopus clypealis* Leth.
21. *Idioscopus tagalicus* sp. nov.
22. *Idiocerinus melichari* sp. nov.
23. *Idiocerinus nacreatus* sp. nov.

NOTES ON JAPANESE LEPIDOPTERA AND THEIR LARVÆ: PART III *

By A. E. WILEMAN
(*Manila, P. I.*)

THREE COLORED PLATES

HETEROCERA

BOMBYCIDÆ

Genus THEOPHILA Moore

Theophila MOORE, Proc. Zool. Soc. Lond. (1867), 683.

Theophila falcigera Butler.

Plate I, fig. 1, young larva; fig. 2, food plant; fig. 3, adult larva; fig. 4, head and thoracic segments.

Japanese name, *ō-kuwa modoki.*

Lagyra falcigera BUTLER, Ill. Typ. Lep. Het. (1878), 2, 45, Pl. 35, fig. 4, ♀; PRYER, Trans. Asiat. Soc. Japan (1883), 12, No. 204.

Oberthüria falcigera MATSUMURA, Cat. Insect. Jap. (1905), 1, 48.

Hyposidra falcigera LEECH, Ann. & Mag. Nat. Hist. (1897), VI, 19, 314; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1909), suppl. 1, 50, Pl. 8, fig. 6, ♀.

=? *Euphranor caeca* OBERTH., Etud. d'Ent. (1880), 5, 40, Pl. 6, fig. 11, ♂.

=? *Oberthüria caeca* STGR., Rom. Mém. Lép. (1892), 6, 337; STGR. and REB., Cat. Lep. Pal. (1901), 1, 128, No. 1044; GRÜNBERG, Seitz's Macrolep., Faun. Pal. (1911), 1, 190, Pl. 35e.

=? *Oberthuria rutilans* GRÜNBERG, Seitz's Macrolep., Faun. Pal. (1911), 1, 190 (ab. of *caeca.*)

=? *Andraca gracilis* BUTLER, Cist. Ent. (1885), 3, 125, No. 22; LEECH, Proc. Zool. Soc. Lond. (1888), 625, No. 217; LEECH, Trans. Ent. Soc. Lond. (1898), 272; GRÜNBERG, Seitz's Macrolep., Faun. Pal. (1911), 1, 190.

The larva figured (Plate I, figs. 1 and 3) was taken in August, 1902, at Hakodate, Oshima Province, Hokkaido (Yezo), on *itaya-kaede,* a species of maple (*? Acer pictum* Thunb.). The artist figured the larva in the young stage on August 13, 1902, and again in its full-grown stage on August 27, 1902. No record

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* The first paper of this series was printed in *This Journal, Sec. D* (1914), 9, 247–268, 3 pls.; part II, in (1915), 10, 281–306, 3 pls.

was made of the date of pupation, but a female imago emerged July 7, 1903, which I identified at the British Museum (Natural History) as *Lagyra falcigera* Butl. It also agrees well with Butler's figure, which is that of a female. The larva figured is the only one of this species I have ever taken or seen and attracts particular attention on account of its peculiar cobralike thorax.[1] The head is retractile and, together with segments 2 and 3, can be almost entirely withdrawn into segment 4, giving the larva the appearance of a cobralike serpent. Poulton alludes to similar instances in larvæ when discussing protective mimicry, instances in which "the defenceless form lives upon the reputation of some dangerous animal belonging to another subkingdom: * * * Such caterpillars terrify their enemies by the suggestion of a cobra-like serpent." He gives as illustrations the larvæ of *Chaerocampa elpenor* and *Chaerocampa porcellus*.[2] The particular form of protective mimicry suggested by the larva of *Theophila falcigera* should probably be classed under pseudaposematic colors.[3]

Larva.—The following description of the larva is taken from my original figure: Length, full-grown about 55 millimeters. Anterior or thoracic segments—namely 2, 3, 4—broadly light olive with expanded ochraceous lobes on segments 4 and 5; olive dorsal stripe; lateral ground color whitish olive with darker olive streaks; a yellowish oblique stripe on segments 9 and 10, running down the side of proleg on segment 10; caudal horn thick at base and olive-colored, tapering to a slender yellowish filament at the apex; spiracles black. (In this description the head is taken as the first segment.) The young larva is much darker in color and the caudal horn is somewhat longer. When the larva is not feeding, it very often hangs from the leaf head downward and in this position mimics a dead leaf.

Butler places the present species in the genus *Lagyra* Walker, among the Geometridæ. Leech also places it among the Geometridæ, but in the genus *Hyposidra* Guénée. There is no doubt, however, that the larva has no affinity with this family, but that its proper place is among the Bombycidæ, where the species is placed in the British Museum (Natural History) under the genus *Theophila* Moore, to which I have accordingly assigned it.

Butler's type of *L. falcigera*, a female, came from Hakodate, Hokkaido (Yezo), and there appears to be no male specimen in the British Museum collection. Staudinger remarks that the female of *falcigera* Butler appears to be the female of *Euphranor caeca* Oberthür (the type of which is a female), or of a species very closely allied to the latter. I am inclined to share the same opinion and have provisionally included *E. caeca* as a synonym of *T. falcigera. Euphranor caeca* is placed by Staudinger and Seitz in *Oberthüria* of the Bombycidæ. Possibly *falcigera* is referable to this genus and not to *Theophila,* as the larvæ of *Theophila falcigera* and *Theophila mandarina* are very different in form and color, although they have this special point in common that they both exhibit the same form of protective mimicry alluded to by Poulton under pseudaposematic colors.[4]

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[1] See previous papers for nomenclature of segments.

[2] The Colours of Animals. 2d ed. London (1890), 257–259, figs. 55–56.

[3] See Wileman, *This Journal, Sec. D* (1914), 9, table I, facing p. 248.

Theophila mandarina has two eyelike spots on each side of segment 4, which is much swollen, and when segments 1 (head) to 3 are withdrawn into segment 4, the larva assumes the threatening snakelike attitude of a *Chaerocampa* larva alluded to by Poulton.[5]

I am also inclined to think that *Andraca gracilis* Butler, the type of which is a female, is a form of *falcigera* Butler. *Andraca gracilis* is possibly the normal female of *caeca* (= *falcigera*), while the typical female *falcigera* is probably a dark variety. I have only one male specimen of *falcigera,* taken at Tobetsu, Hokkaido (Yezo), July 20, 1902, which agrees in markings with Oberthür's male *caeca,* but not in size nor in color. I am inclined to think that *caeca* is merely a light fawn-colored ("fauves ailes") form of *falcigera.*

Butler's type of *Lagyra falcigera* (♀) was from Hakodate, Hokkaido (*Whitely*). Butler's type of *Andraca gracilis* (♀) was from Nikko, Honshu (*Pryer*). Oberthür's type of *caeca* (♂) was from Askold Island, eastern Siberia. Askold Island is situated on the coast opposite Hokkaido (Yezo).

Pupa.—The pupa is inclosed in a smooth, light golden brown, semitransparent cocoon, stiff in texture. It has a transverse slit at the top like the cocoon of *Rhodinia fugax* Moore, which belongs to the Saturniidæ.

Local distribution.—Theophila falcigera: Hokkaido (Yezo), Junsai Numa, near Hakodate, July, 1 male, 1 female. Matsumura records the species from Hokkaido (Yezo) and Honshu.

General distribution.—Theophila caeca, eastern Siberia (Ussuri?) ; *T. falcigera,* Japan; *T. gracilis,* Japan.

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[4] See Wileman, loc. cit.

[5] Loc. cit.

Theophila mandarina Moore.

Plate II, fig. 5, larva; fig. 6, food plant.

Japanese names, *kuwago; yama-kaiko.*

Theophila mandarina MOORE, Proc. Zool. Soc. Lond. (1872), 576, Pl. 33, fig. 5; SEITZ, Macrolep., Faun. Pal. (1911), 1, 190, Pl. 351, ♂.

Bombyx mandarina LEECH, Proc. Zool. Soc. Lond. (1888), 626,No. 222; LEECH, Trans. Ent. Soc. Lond. (1898), 271, No. 22; MATSUMURA, Injurious Jap. Insects (Nihon Gaichūhen) (1899), 55, fig. 1, imago, ♂; fig. 2, ovæ; fig. 3, larva; MATSUMURA, Cat. Insect. Jap. (1905), 1, 48, No. 391; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1909), suppl. 1, 138, Pl. 13, fig. 18, ♂.

Bombyx fuscata MOTSCH., Bull. Soc. Nat. Mosc. (1866), 39, 1, 192.

The larva figured (Plate II, fig. 5) was taken September 8, 1902, at Hakodate, Oshima Province, Hokkaido (Yezo), on mulberry, named in Japanese *kuwa.*[6] This larva died without passing through its metamorphoses, but I bred one male and three females from similar larvæ, which are common on mulberry trees.

Larva.—The following description of the larva is taken from my original figure: Color, grayish brown; segments 4 and 5 abnormally distended dorsad; on segment 4 a subdorsal, black ocelluslike spot, ringed internally with red and externally with black; on segment 6 a black ocelluslike spot, ringed internally with gray and externally with black; a short caudal horn.

This larva is another striking example of the form of protective mimicry exhibited by its near ally *Theophila falcigera* Butler, which has been alluded to in the notes on the latter species.

Matsumura[6] records the life history of this species under *Bombyx mori* var. *mandarina* Moore and gives figures of the ovæ, larva, and male imago.

He says that in Hokkaido it is single-brooded and hibernates in the ova stage. The ovæ, which are deposited in rows on mulberry twigs, hatch in the following spring. The larva spins its cocoon after the fourth molt in precisely the same way as the domesticated silkworm, *Bombyx mori* Linn. However, owing to the fact that it lives in a wild state, it takes a longer time in attaining full growth and does not spin its cocoon until the end of July or the beginning of August. The cocoon, which is of an ashy white or ashy yellow color, is spun in a curled up leaf, and the imago emerges in about two weeks.

Pupa.—The pupa is inclosed in a flimsy yellowish cocoon spun in the leaves of the mulberry. It is of no use for silk, as the thread cannot be reeled.

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[6] Injurious Jap. Insects (Nihon Gaichūhen) (1899), 55, Pl. 24, figs. 1 to 3.

Leech remarks that *Bombyx mandarina* is "probably the wild form of *Bombyx mori.* In color the imago is darker and the markings are distinct, the female is much larger than the same sex of *B. mori.*" I have captured it in Honshu and Hokkaido (Yezo) in June, August, October, and November, and Matsumura records it from Hokkaido (Yezo), Honshu, Shikoku, and Kyushu, and Seitz records it from eastern China, Korea, and Japan.

Seitz states that *Bombyx fuscata* Motschulsky from Japan appears, according to the descriptions, to be only a dark form of *mandarina.*

GEOMETRIDÆ

GEOMETRINÆ

Genus **EUCHLORIS** Hübner

Euchloris HÜBNER, Verz. Bek. (1827), 283.

Euchloris difficta Walker.

Plate I, fig. 5, larva, lateral aspect; fig. 6, larva, dorsal aspect.

Japanese name, *shirofu-aoshaku.*

Comibaena difficta WALK., Cat. Lep. Het. (1861), 22, 576; BUTLER, Ill. Typ. Lep. Het. (1879), 3, 37, Pl. 50, fig. 3, ♂.

Euchloris difficta LEECH, Ann. & Mag. Nat. Hist. (1897), VI, 20, 236; MATSUMURA, Cat. Insect. Jap. (1905), 1, 117, No. 1006; NAGANO, Insect. World [Konchū Sekai (Jap.)] (1909), 13, 91, Pl. 5, figs. 1 to 8, larva, pupa, imago, ♂ ♀.

Phorodesma gratiosaria BREM., Lep. Ost.-Sib. (1864), 77, Pl. 7, fig. 1, ♀ (teste Warren).

Ochrognesia difficta WARREN, Nov. Zool. (1894), 1, 391.

The larva figured (Plate I, figs. 5 and 6) was taken in May, 1901 (figured May 5), at Kobe, Settsu Province, Honshu, on willow; Japanese name, *yanagi.*

This larva was unfortunately thrown away with old dry leaves when changing the daily supply of food, and I was never able to discover another larva to breed and compare with the figure drawn by my artist. I was much vexed that I did not have an opportunity of further observing it, as it is a most striking example of procryptic colors affording special protective resemblance.

Poulton defines this class of resemblance as "resemblance in shape and outline, as well as in color, to some object in the environment as a protection against enemies." [7]

In this case the larva both in shape and outline mimics, or resembles, the unexpanded leaf buds of the willow and thus effects concealment from its enemies.

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[7] See Wileman, loc. cit.

Fortunately, owing to the researches of Nagano, the well-known authority on Japanese lepidopterous larvæ, I am now able to give the figure of this larva, which has been identified by me from Nagano's figures as that of *Euchloris difficta* Walker. Nagano has published a description of the larva and its habits, accompanied by three figures representing its dorsal and lateral aspects.[8]

The figures of my larva agree very well with those given by him, and I have no doubt as to its identity. Nagano, however, has not succeeded in portraying so faithfully, as has my artist, the exact mimetic resemblance of this larva to the unexpanded leaf buds of a willow. The figure in my plate (fig. 6) represents the larva at rest, and in this position, while it lies flat along the willow twig, it exactly resembles willow buds in various stages of expansion. The caudal lobes of the larva, which are green, represent the more developed stage of the buds; the cephalic lobes, the undeveloped buds. This position imparts to it a most deceptive protective resemblance and thus secures it immunity from its enemies when it is quiescent.

Larva.—The following description is taken from my original figure: Length, 32 millimeters. Segments 2 to 9 acutely bilobed; the lobes of segments 2 to 5 brownish black, those of segments 6 to 8 green; segments 9 to 11 brownish black; with pale mediodorsal and spiracular stripes; ventrum brownish black.

Leech states that Warren considers *Phorodesma gratiosaria* Bremer, from eastern Siberia, as identical with *Euchloris difficta.* A comparison of Nagano's figures of the male and female imagoes of *difficta* with the female imago figured by Bremer seems to confirm this opinion and, therefore, I have included *gratiosaria* as a synonym of *difficta.*

Nagano states that he has not discovered the ova of this species, but that the larva probably hatches in April, feeding on *kawa-yanagi* and *kōri-yanagi.* Matsumura in his Catalogue of Japanese and foreign plants of Japan gives *Salix purpurea* L. as the botanical name of kawa-yanagi and *S. purpurea* var. *multinervis* Fr. and Sav. as that of kōri-yanagi; both are willows. My larva was taken some time previous to May 5, when it was figured. The insect pupates from May to June and the adult emerges from June to July. Nagano took his specimen May 19; it pupated June 2, and the adult emerged June 20. Nagano also thinks that *E. difficta* is not properly placed in the genus *Euchloris,* as the larva differs very much in appearance from those of other species of the genus found in Europe. Probably the ova passes the winter without hatching, or there may be a second brood later in the year.

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[8] *Insect World* (Konchū Sekai) (1909), 13, Pl. 5, figs. 1–8.

Leech records the species from northern and central China, eastern Siberia, Korea, and Japan.

Genus **MEGALOCHLORA** Meyrick

Megalochlora Meyrick, Trans. Ent. Soc. Lond. (1892), 95.

Megalochlora valida Felder and Rogenhofer.

Plate I, fig. 7, larva; fig. 8, food plant; fig. 9, head.

Japanese name, *schiroseuji-aoshaku.*

Geometra valida Feld. and Rogenh., Reise der Novara (1875), 5, Pl. 127, fig. 37.

Megalochlora valida Stgr., Iris (1897), 10, 1; Stgr. and Reb., Cat. Lep. Pal. (1901), 1, 262; Matsumura, Cat. Insect. Jap. (1905), 1, 116, No. 1001; Prout, Seitz's Macrolep. of the World (1912), 4, Pl. 1, fig. 1, ♂; Sasaki, Insects Injurious to Japanese Trees [Nihon Jūmoku Gaichūhen (Jap.)] 3d ed. (1910), pt. 2, 47, Pl. 96, larva, pupa, imago, ♂.

Geometra dioptasaria Christ, Bull. Mosc. (1890), 9.

The larva figured (Plate I, fig. 7) was taken in April, 1901, at Kobe, Settsu Province, Honshu, on dwarf oak, Japanese name, *kunugi* (*Quercus serrata* Thunb.), and a male imago was bred from it June 1, 1901.

The coloration of this larva is an example of procryptic colors, affording special protective resemblance.[9] In this case the larva mimics the young leaf buds and leaves of the oak as will be observed on reference to the figure. The color of the spines on segments 5 and 12, the lateral blotches on segments 9, 10, and 11, and the anal segment harmonize extremely well with the young leaf buds of the tree, which are of the same color, and render the larva difficult of discovery, although one may search very closely for it.

Larva.—The following description is taken from my original figure: Length, about 36 millimeters. Light green; paired dorsal tubercles on segment 3; two pairs of long dorsal spines on each of segments 5, 6, 7, 8, 9, and 12, those on segments 5 and 12 light red-brown, all the others light green tipped with brown; light red-brown lateral blotches on segments 9, 10, and 11; anal segment entirely light red-brown. It is appropriate to mention

[9] See Wileman, loc. cit.

here that the larva of the closely allied species *Megalochlora sponsaria* Bremer[10] is very similar to that of *M. valida.* However, it is much smaller, with only four pairs of dorsal spines all directed forward instead of six pairs as in *valida.* It is green without dark markings. I bred two imagoes from larvæ of *M. sponsaria* at Kobe on June 18, 1901, and July 21, 1902, respectively, but my artist did not figure the larva, so I think it advisable to mention the resemblance here.

Pupa.—The pupa of *M. valida* is green, sparsely spotted with black dots on the dorsum.

I have taken *valida* in Honshu Island in June and July only. Matsumura records it from Honshu and from eastern Siberia. The larva appears in April with the young buds of the oak, the pupa in May, and the imago in June and July. I have never taken specimens of the imago later than July; therefore it is probably single brooded.

GEOMETRIDÆ

BOARMIINÆ

Genus **AUAXA** Walker

Auaxa WALKER, Cat. Lep. Het. (1860), 20, 271.

Auaxa cesadaria Walker.

Larva of *Auaxa sulphurea* Butler. Plate II, fig. 1, larva; fig. 2, food plant; figs. 3, 4, larva, previous to pupation.

Japanese name, *ki-edashaku.*

Auaxa cesadaria WLK., Cat. Lep. Het. (1860), 20, 271.

Bizia sulphurea BUTLER, Ill. Typ. Lep. Het. (1878), 2, 47, Pl. 35, fig. 10.

Auaxa sulphurea LEECH, Ann. & Mag. Nat. Hist. (1897), VI, 19, 220; MATSUMURA, Cat. Insect. Jap. (1905), 1, 148, No. 1265.

The larva figured (Plate II, fig. 1) was taken in July (figured July 2), 1902, at Hakodate, Oshima Province, Hokkaido (Yezo), on wild rose; Japanese name, *no-bara* (*Rosa multiflora* Thunb.). It pupated July 6, and an adult female emerged August 3, 1902. Another female emerged from a larva (Plate II, figs. 3, 4) taken in May, 1901, at Kobe, Settsu Province, Honshu, and two males and one female from larvæ taken July 29 and 31, 1902.

Pupa.—The pupa is inclosed in a frail cocoon spun among rose leaves.

Larva.—The following description is taken from my original figure: Length, 37 millimeters. Pale green, a lateral series of four pairs of curved pink spines situated on segments 5, 6, 7, and 8; a pair of similar spines, submediad, on the dorsum

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[10] Lep. Ost.-Sib. (1864), 77, Pl. 7, fig. 25.

of segment 12. These spines almost exactly mimic the young pink spines of the wild rose. The coloration of this larva seems to suggest procryptic colors, affording special protective resemblance.[11]

When this larva is hidden by the green leaves of the rose, it is most difficult of detection; lying, as it does, flattened against the rose twig, the resemblance of the pink spines to those of the rose completes the concealment. I have taken the imago in Hokkaido (Yezo), Honshu, Kyushu, and Shikoku in June, July, and August, and Leech records it from Honshu, Kyushu, and central and western China. The larva appears from June to July, the imago from June to August.

Leech[12] remarks that this species is "probably identical with *Auaxa cesadaria* Walker from China, the type of which I have not been able to discover." In the British Museum collection *Bizia sulphurea* Butler is placed as a synonym of *Auaxa cesadaria* Walker from China. However, I have named the larva as that of *Auaxa sulphurea*. Walker's[13] description agrees with Butler's figure.

NOCTUIDÆ

CATOCALINÆ

Genus **METOPTA** Swinhoe

Metopta SWINHOE, Cat. Het. Mus. Oxon. (1900), 2, 170.

Metopta rectifasciata Ménétries.

Plate II, fig. 7, larva; fig. 8, food plant.

Japanese name, *shirosuji-tomoye*.

Sipirama rectifasciata MÉN., Cat. Lép. Het. Mus. St. Pétersb. (1863), Pl. 17, fig. 6; MATSUMURA, Cat. Insect. Jap. (1905), 1, 96, No. 819.

Metopta rectifasciata HMSN., Cat. Lep. Phal. (1913), 12, 301, fig. 50.

Spirama rectifasciata LEECH, Trans. Ent. Soc. Lond. (1900), 575, No. 1325.

Calliodes rectifasciata LEECH, Proc. Zool. Soc. Lond. (1889), 545.

Spiramia japonica WLK., Cat. Lep. Het. (1865), 33, 948, nec Guén.

Spirama interlineata BUTL., Ann. & Mag. Nat. (1878), V, 1, 291; BUTL., Ill. Typ. Lep. Het. (1878), 2, 41, Pl. 34, fig. 2.

The larva figured (Plate II, fig. 7) was taken in September, 1902 (figured September 8), at Hokodate, Oshima Province, Hokkaido (Yezo), on *shiode?* (? *Smilax herbacea* Linn. var. *nipponica* Maxim.). I am not sure about the name of the food plant, but it was identified by my Japanese collector as shiode, for which the botanical name is given in J. Matsumura's Catalogue of Japanese and foreign plants. A male, which is of the *interlineata* form, emerged in the following year on June 19, 1903.

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[11] See Wileman, loc. cit.

[12] *Ann. & Mag. Nat. Hist.* (1897), VI, 19, 220.

[13] Walker, Cat. Lep. Het. (1860), 20, 271.

This larva is an example of the form of protective mimicry alluded to by Poulton under pseudaposematic colors,[14] which he defines as "an appearance which deceptively suggests something unpleasant, or dangerous to an enemy." In this instance the eyelike subdorsal spots probably suggest something unpleasant to its enemies, as in the case of *Theophila mandarina* and *Ophideres tyrannus*.[15]

Larva.—The following description is taken from my original figure: Length, about 45 millimeters. Color, shades of pinkish and chocolate brown; a broad pinkish brown mediodorsal fascia, marked medially with a series of darker diamond-shaped spots; head with a yellow longitudinal stripe laterad; from the center of the head caudad there runs a subdorsal chocolate-brown stripe, attenuated anteriorly and broadening toward the anal extremity; on segment 4 a midlateral dark blue ocelluslike spot on each side, ringed internally with ochraceous red and externally with black; a subdorsal minute white spot on each of segments 4 to 11; a yellow stripe on each of segments 8 and 9, extending from spiracles to end of prolegs; a lateral, whitish violet band from segment 8 to 11; dorsal shield on anal segment black.

Pupa.—Brownish black with a purple pruinescence.

Local distribution.—I have taken this species in the following localities: Honshu. Oyama, Sagami Province, May; Nikko, Shimotsuke Province, May, July; Dorokawa, Yamato Province, July. Kyushu. Beppu, Bungo Province, May; Iida-san, Higo Province, August. Leech records it from Tsuruga and Shimonoseki in Honshu, June, July. Matsumura records it from Honshu, Kyushu. Hampson records it from Hokkaido (Hakodate), Kyushu, and Honshu (from Tsuruga, Nikko, Yokohama).

General distribution.—Japan, Korea, northern and central China, and Formosa.

NOCTUIDÆ

Genus **OPHIDERES** Boisduval

Ophideres BOISDUVAL, Faun. Ent. Madag. Lép. (1833), 99.

Ophideres tyrannus Guénée.

Plate III, fig. 1, larva, dorsal aspect; fig. 2, food plant; fig. 3, larva, lateral aspect.

Japanese name, *akebi-kohoha*.

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[14] See Wileman, loc. cit.

[15] See this article, pp. 347, 348, and 356.

Ophideres tyrannus GUÉN., Noct. (1852), 3, 110; HAMPSON, Moths India (1894), 2, 562; LEECH, Proc. Zool. Soc. Lond. (1889), 544, No. 326; LEECH, Trans. Ent. Soc. Lond. (1900), 577, No. 1329; STGR. and REB., Cat. Lep., Pal. (1901), 1, 247; MATSUMURA, Cat. Insect. Jap. (1905), 1, 98, No. 835; NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] (1908), 12, 315, 354, Pl. 8, figs. 1–9, larva, pupa, imago, ♀; NAGANO, Insect World (1912), 16, 41; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1910), suppl. 2, 1, Pl. 17, fig. 1, ♂; SASAKI, Insects Injurious to Fruit Trees [Kwajū Gaichūhen (Jap.)], 5th ed. (1911), 166, Pl. 50, imago.

Ophideres amurensis STGR., Rom. Mém. Lép. (1892), 6, 581; STGR. and REB., Cat. Lep., Pal., 1, 247; OBERTH, Etud. d'Ent. (1880), 5, 86 (= ? *fullonica* Linn.).

Adris tyrannus MOORE, Trans. Zool. Soc. Lond. (1881), 11, 69, Pl. 12, fig. 5.

The larva is figured in two positions (Plate III, figs. 1 and 3). The larvæ from which these figures were drawn were taken in September and October, 1900 (figured September 21 and October 1), at Yoshino, Yamato Province, Honshu, on a creeper with large golden yellow fruit, known in Japanese as *akebi* (*Akebia quinata* Decne.). I bred from them a male and a female imago, which emerged November 8, 1900, and December 4, 1900, respectively. These are apparently not referable to typical *Ophideres tyrannus*, but to the form described by Staudinger as var. *amurensis*. I also took the larva, which evidently belongs to the first brood at Yoshino, on May 12, and from it an imago was bred June 10, 1901. I found a green form of larva at Hakodate, Hokkaido (Yezo), in which the markings were rather more distinct than in the form figured, but this was not bred. It was feeding on barberry (*Berberis* sp.). Nagano,[16] who has written at some length on the transformations of this species, states that no fixed rule can be laid down as to the color of the larva, which varies according to its stage and the locality it inhabits.

Larva.—The following description is taken from my original figure: Length, about 67 millimeters. Blackish brown with a pink tinge dorsally; of a darker shade laterally; sprinkled with yellowish patches and dots; a conspicuous yellow patch on segment 10 spotted with the ground color; two prominent ocellus-like spots on segments 6 and 7, internally black, centered with blue, and ringed externally with a broad yellow circle; segment 12, humped. There seem to be two or three broods of the larva in the year.

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[16] Nagano, *Insect World* (1908), 12, 315, 354, Pl. 8, figs. 1–9, larva, pupa, imago, ♀.

This larva is an example of the form of protective mimicry alluded to by Poulton under pseudaposematic colors.[17]

Poulton[18] mentions and gives a figure of an Indian larva, a species of *Ophideres* allied to *O. tyrannus*, which possesses terrifying eyelike spots similar to those of the larva of *tyrannus*, and which assumes a terrifying attitude—

> by doubling the front part of its body beneath the rest, the bend being made at the spot where the eye-like marks are placed so that the latter are brought into an appropriate position at the anterior end, while the real head is, of course, concealed under the body.

This attitude, which is also assumed by *O. tyrannus*, is well figured by Nawa.[19] When the larva wishes to assume a terrifying attitude, it elevates the anal segments and doubles segments 1 to 5 beneath the succeeding ones, making the eyelike spots on segments 6 and 7 very conspicuous. My artist has not figured *tyrannus* in a terrifying attitude, but it will be noted that in Plate III, fig. 3, the anal segments are elevated, giving also a minatory aspect to the posterior segments of the larva, so that it is apparently protected fore and aft.

The imago lies concealed in dark places in the daytime, and can only be taken by beating, as it does not come to light nor to sugar. It is commonly known among professional Japanese collectors as *ki-no-ha tora*, or the leaf tiger, as when at rest it resembles a dead leaf. The orange underwings are exposed only in flight and are then very conspicuous. This species, therefore, is protected in both the larval and imago stages.

Leech remarks:

> the primaries of the wings of the imago vary considerably in tint and in the amount of green markings and some specimens seem to agree with the form described by Staudinger as var. *amurensis*, in which the primaries are unicolorous brown, darker than is usual in typical examples. There are all intergrades, between this form and the type occurring in China.

Matsumura records *Ophideres tyrannus* from Hokkaido (Yezo), Honshu, and Kyushu and from India and China. He records var. *amurensis* from Japan and eastern Siberia (Ussuri, Amurland). I have captured it in Honshu during all months from May to December, with the exception of July.

Sasaki[20] states that the larva appears about July and feeds on akebi and also on *hiragi-nanten* (*Berberis bealei* Fort.), and that the imago appears from the end of August to December. As I have taken the larva at Yoshino, Yamato, in May, the young larvæ possibly hibernate.

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[17] See Wileman, loc. cit.

[18] Colours of Animals (1890), 263, fig. 57, Indian larva (*Ophideres*). This is probably the Indian form of *O. tyrannus*, which is also recorded from Calcutta and the Himalayas.

[19] *Insect World* (Konchū Sekai) (1912), 16, 41 (woodcut); Ibid. (1908), 12, Pl. 8, fig. 3.

[20] Insects Injurious to Fruit Trees (Kwajū Gaichūhen) (1911), 167.

Local distribution.—Honshu. Koya-san, Kishu Province, August, September; Yoshino, Yamato Province, June; Kobe, Settsu Province, October to December. Hokkaido (Yezo). Hakodate, Oshima Province, September.

Cocoon.—The larva spins a loosely webbed cocoon among the leaves of the food plant.

Matsumura [21] states that the imago causes injury to such fruits as pears, peaches, etc., by sucking their juices. The following references to this habit alluded to in the Zoological Record and elsewhere are of much interest:[22]

> The proboscis of *Ophideres* is modified into a strong, rigid, boring instrument, armed with spines, with which the insect pierces the skin of oranges and sucks the juice. [The proboscis of *O. fullonica* L. is figured.]
>
> *Ophideres fullonica* and its allies do not perforate oranges, etc., but enlarge the hole previously made by some other insect and suck the juice through that.[23]

The structure of the proboscis of *O. fullonica* is also described, with figures, by F. Darwin.[24]

ZYGÆNIDÆ

CHACOSIINÆ

Genus **ELCYSMA** Butler

Elcysma BUTLER, Trans. Ent. Soc. Lond. (1881), 4.

Elcysma westwoodii Vollenhoven.

Plate III, fig. 4, larva; fig. 5, pupa, dorsal aspect; fig. 6, pupa, abdominal aspect; fig. 7, apex of cocoon; fig. 8, cocoon, lateral aspect; fig. 9, cocoon, upper aspect; fig. 10, food plant.

Japanese name, *usuba-tsubamega.*

Agalope westwoodii VOLL., Tidjschr. Voor. Ent. (1863), 6, 136, Pl. 9, fig. 3.

Elcysma westwoodii ELWES, Proc. Zool. Soc. Lond. (1890), 386, Pl. 34, fig. 5; STGR. and REB., Cat. Lep., Pal. (1901), 1, 392, No. 4428; LEECH, Trans. Ent. Soc. Lond. (1898), 349, No. 261; MATSUMURA, Cat. Insect. Jap. (1905), 1, 183, No. 1529; NAGANO, Nawa's Insect World [Konchū Sekai (Jap.)] (1907), 11, 489, Pl. 13, larva, pupa, imago, ♂ ♀, and (1912), 16, 512; MATSUMURA, Thousand Insects of Japan [Nihon Senchū Dzukai (Jap.)] (1911), suppl. 3, 3, Pl. 30, fig. 3, ♀; JORDAN, Macrolep. of the World, Faun. Pal. (1910), 2, 13, Pl. 3a; MIYAKE, Tokyo Zool. Mag. [Tōkyō Dobutsugaku Zasshi (Jap.)] (1907), 19, No. 220, 41; Pl. (unnumbered), fig. 5; SASAKI, Insects Injurious to Fruit Trees [Kwajū Gaichūhen (Jap.)], 194 (larva); MATSUMURA, Classification of Insects [Konchū Bunruigaku (Jap.)], pt. 1, 233.

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[21] Thousand Insects of Japan (Nihon Senchū Dzukai) (1910), suppl. 2, 1.

[22] *Zool. Rec.* (1875), 12, 441; see also J. Kunckel, *Compt. rend. Acad. sci.* (1875), 81, 387–400. Translation in *Ann. & Mag. Nat. Hist.* (1875), IV, 16, 372–374, and *Bull Soc. Ent. Fr.* (1875), 5, 212.

[23] *Zool. Rec.* (1877), 14, 167; see also Pilcher, *Cis. Ent.* (1875), 2, 237–240.

[24] *Zool. Rec.* (1875), 12, 441; see also F. Darwin, *Quart. Journ. Micros. Sci.* (1875), n. s. 15, 384–389, and *Month. Micros. Journ.* (1875), 19, 235–236.

Elcysma translucida BUTL., Trans. Ent. Soc. Lond. (1881), 4; PRYER, Trans. Asiat. Soc. Japan (1883), 43, No. 82; LEECH, Proc. Zool. Soc. Lond. (1888), 612, No. 155.

Elcysma caudata BREM., Lep. Ost.-Sib. (1864), 97, Pl. 8, fig. 8; ELWES, Proc. Zool. Soc. Lond. (1890), 387, Pl. 34, fig. 6; STGR., Rom. Mém. Lép. (1892), 6, 248; STGR. and REB., Cat. Lep. Pal. (1901), 1, 392, No. 4428a; JORDAN, Macrolep. of the World, Faun. Pal. (1910), 2, 13, Pl. 3a; SASAKI, Insects Injurious to Fruit Trees [Kwajū Gaichūhen (Jap.)], 5th ed. (1911), 194, Pl. 60b, larva, imago, ♂.

The larva figured (Plate III, fig. 4) was taken in May, 1901 (figured May 21), at Yoshino, Yamato Province, Honshu, on *sumomo* (*Prunus communis* Huds.), a species of plum tree. I have bred the imago on several occasions from larvæ taken at Yoshino, and I have never found them elsewhere. I have found the larva living in a gregarious state on sumomo and another tree which my Japanese collector named *me-ga-hadzusa*. This, I presume, is a local name, as I am unable to find it in Matsumura's Catalogue of Japanese trees and plants.

The first time that I found the larvæ of *Elcysma westwoodii* was on June 23, 1895, at Imoseyama, Yoshino. They were feeding on a me-ga-hadzusa, a tall tree with rank-smelling white flowers. The branches of this tree had been almost entirely denuded of foliage. However, there were very few larvæ left, as they had evidently all pupated, but I found under the tree a number of their curious boat-shaped cocoons fixed to the leaves of dwarf camellias and oak bushes. The second time I went to Yoshino was on June 11, earlier in the year by twelve days, and judging from my experience of 1895, I hoped to find the larva in greater abundance, but I was disappointed, as there were very few to be found. In 1901 I paid another visit to Yoshino about May 15 and succeeded in finding them in great numbers feeding on sumomo.

Nagano writes at length on the metamorphoses of *E. westwoodii* and gives the following details:

> The flight of the imago is sluggish and it is easy to capture. The

larva, which in Gifu, province Mino, Honshū, feeds on Momo (Peach) and Sakura (Cherry), first appears there in May and June. In June and July it is full-grown and spins its cocoon. The imago appears from the end of September to the middle of October.

This agrees with my experience, as on June 11 and 23 there were very few larvæ to be found at Yoshino, but many cocoons, whereas on May 15 I found the larvæ in profusion. One larva which I bred pupated as late as August 15.

I have never myself seen the imago flying, but my Japanese collector captured many specimens at Yoshino in August and September and some in Kyushu in October.

Sasaki states that the imago appears at the end of July, but Nagano has never seen it flying at Gifu in this month, as it does not appear there before September. The examples of this species in the Nawa collection at Gifu, numbering over one hundred specimens, were all taken there between the end of September and the middle of October.

Nagano states that he bred young larvæ from a batch of eggs laid the middle of October. These eggs were placed in a moderately warm greenhouse and hatched at the end of October. He questions whether this would occur in a state of nature, as the rapid incubation may have been due to the unusual warmth. If it is their usual habit to hatch at that time of the year, they would suffer from scarcity of food and, therefore, probably would hibernate in the larval state. If these eggs were forced by the heat of the greenhouse and it were unnatural for them to hatch at that time, they would probably hibernate in the egg stage.

Larva.—The following is a description of the larva taken from one found on May 15, 1901: Length, 29 millimeters. Light greenish yellow; head retractile, almost hidden by deep skin fold of second segment, black, smooth, shiny, a black spot on each side of mandibles; two black submedian spots near dorsal margin of segment 2, and one black spot on each side of same segment; from segment 3 to the anus there extend five violet-brown longitudinal stripes: one mediodorsal, two midlateral, and two spiracular. Spiracles black; the dorsal region has minute, paired black bristles on each segment situated on each side of the mediodorsal line and also a minute bristle issuing from ventrad of the midlateral stripe on each segment. Ventrad to the spiracles and the spiracular stripe there is on each segment, from 3 to anus, a single, slender, long black bristle, feathered somewhat like the antenna of a *Procris*, those on the anterior and posterior segments being rather longer. On the dorsum of segment 2 there are also paired black bristles, one on each side of the black spot;

also two bristles on each side of the anus, altogether twenty-six bristles; the mediodorsal stripe is dilated somewhat into a small diamond pattern; segmental sutures strongly marked; ventrum, legs, and prolegs yellowish white. The caterpillar is sluggish in movement and drops from the leaf by a silken thread when disturbed.

Pupa.—The larva seems to spin its cocoon on the upper surfaces of such leaves as camellias or oak bushes. The cocoon is somewhat boat-shaped and is placed with the flat surface (Plate III, fig. 9) resting on, and parallel with, the midrib of the leaf, the sides of which are drawn together and give support to the sides of the cocoon which adhere to the drawn-in leaf. Therefore, only the curved keellike dorsum (Plate III, fig. 8) of the cocoon is exposed to view, while the rest is concealed by the leaf. The cocoon is dirty white and is parchmentlike in texture, being moderately tough. The pupa is ringed and streaked with golden brown, dorsally of a yellowish golden tinge, and wing cases golden brown.

Staudinger's description of the larva and cocoon of *E. caudata* Brem. agrees very closely with my description of those of *E. westwoodii*, and this seems to prove that *caudata* is merely a local form of *westwoodii* as mentioned by Jordan. Staudinger also states that the larva and cocoon of *caudata* have a certain resemblance to those of *Aglaope infausta* (sic = ? *Agalope*).

Imago.—I have noticed in *Elcysma westwoodii* that the tails of the hind wings of the female are often shorter than those of the male and that the forewings of the female are not so heavily powdered with fuscous scales at the apex as in the male. My Japanese collector informed me that this insect is very local and only flies in the early morning, seldom afterwards. It seems to be abundant locally, my collector having taken over a hundred specimens. Pryer remarks:

> this flies by day and the first one I saw flying I took to be a new *Parnassius*, it has long curled tails and is a very peculiar insect.

The type of *Agalope westwoodii* was described by Vollenhoven from a male captured in Japan by Doctor Siebold, not "from a female found at Port May, Japan, August 15," as stated by Staudinger.[25]

Local distribution.—Honshu. Yoshino, Imoseyama, Yomato Province, August, September (*Wileman, Pryer*); Gifu, Mino Province, September, October (*Nagano, Pryer*). Kyushu.

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[25] *Rom. Mém. Lép.* (1892), 6, 248.

Hiko-san, Busen Province, and Nanaori, Hyūga Province, October.

My Japanese collector informed me that *E. westwoodii* occurs in Hokkaido (Yezo) at Ishigori, Sapporo. Jonas also took it at Osaka, Honshu. Matsumura, however, does not record it from Hokkaido but only from Honshu. Considering the proximity of eastern Siberia to Hokkaido, there seems no reason why *caudata* should not be taken in Hokkaido.

Time of appearance.—Larva, May, June; pupa, June, July, August; imago, August, September, October. Only one brood. Local, but plentiful where found.

General distribution.—*Elcysma westwoodii:* Korea, eastern Siberia (southern Amurland), Japan, and Burma (*Seitz*). *Elcysma caudata:* Eastern Siberia (Askold, Ussuri). It should also occur in Hokkaido.

ILLUSTRATIONS

[Drawings by Hisashi Kaidō.]

PLATE I

FIGS. 1 to 4. *Theophila falcigera* Butler.
1, young larva; *2*, food plant; *3*, adult larva; *4*, head and thoracic segments.
5 to 6. *Euchloris difficta* Walker.
5, larva, lateral aspect; *6*, larva, dorsal aspect.
7 to 9. *Megalochlora valida* Felder and Rogenhofer.
7, larva; *8*, food plant; *9*, head.

PLATE II

FIGS. 1 to 4. *Auaxa sulphurea* Butler.
1, larva; *2*, food plant; *3* and *4*, larva, previous to pupation.
5 to 6. *Theophila mandarina* Moore.
5, larva; *6*, food plant.
7 to 8. *Metopta rectifasciata* Ménétries.
7, larva; *8*, food plant.

PLATE III

FIGS. 1 to 3. *Ophideres tyrannus* Guénée.
1, larva, dorsal aspect; *2*, food plant; *3*, larva, lateral aspect.
4 to 10. *Elcysma westwoodii* Vollenhoven.
4, larva; *5*, pupa, dorsal aspect; *6*, pupa, abdominal aspect; *7*, apex of cocoon; *8*, cocoon, lateral aspect; *9*, cocoon, upper aspect; *10*, food plant.

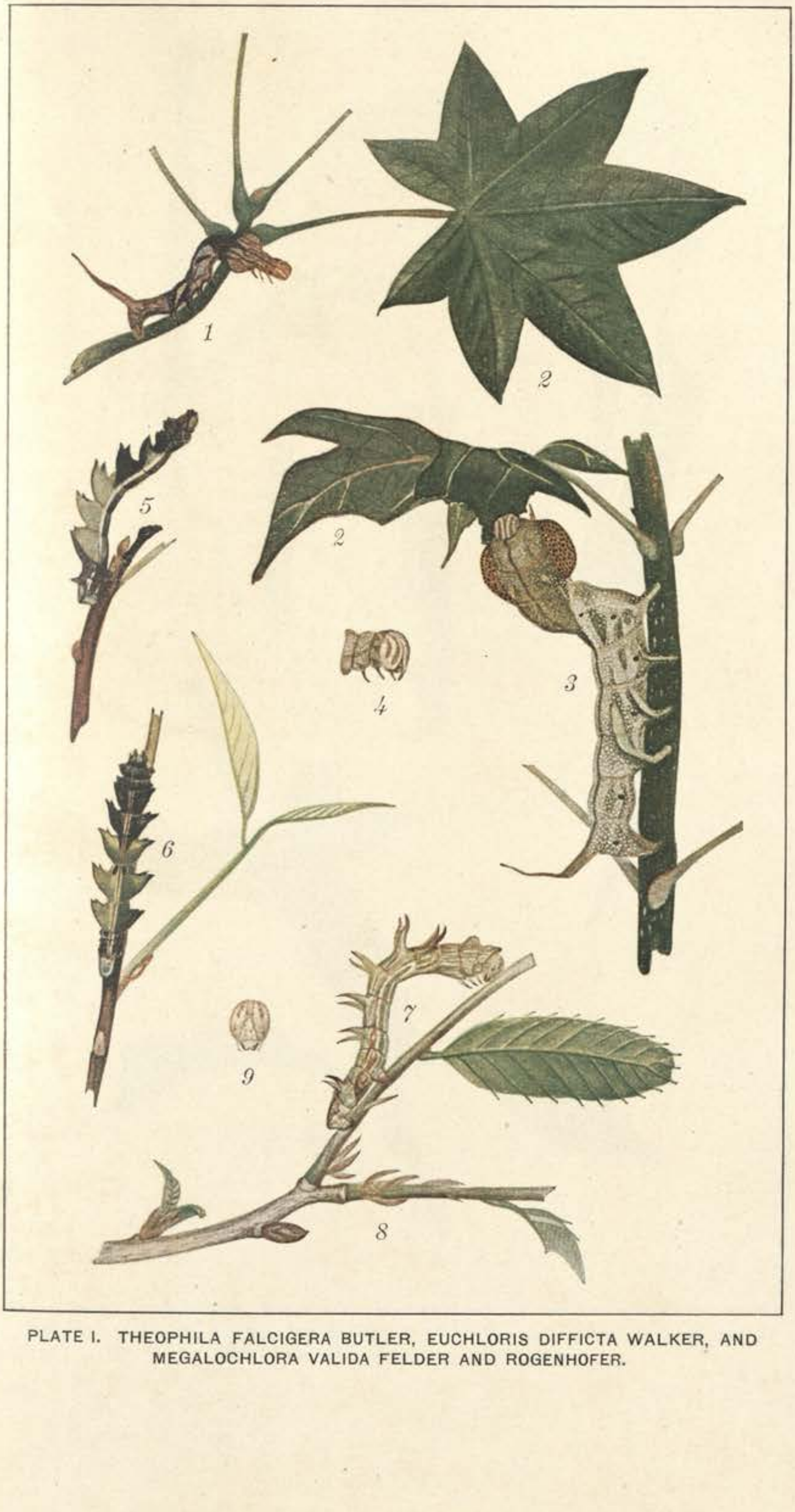

PLATE I. THEOPHILA FALCIGERA BUTLER, EUCHLORIS DIFFICTA WALKER, AND MEGALOCHLORA VALIDA FELDER AND ROGENHOFER.

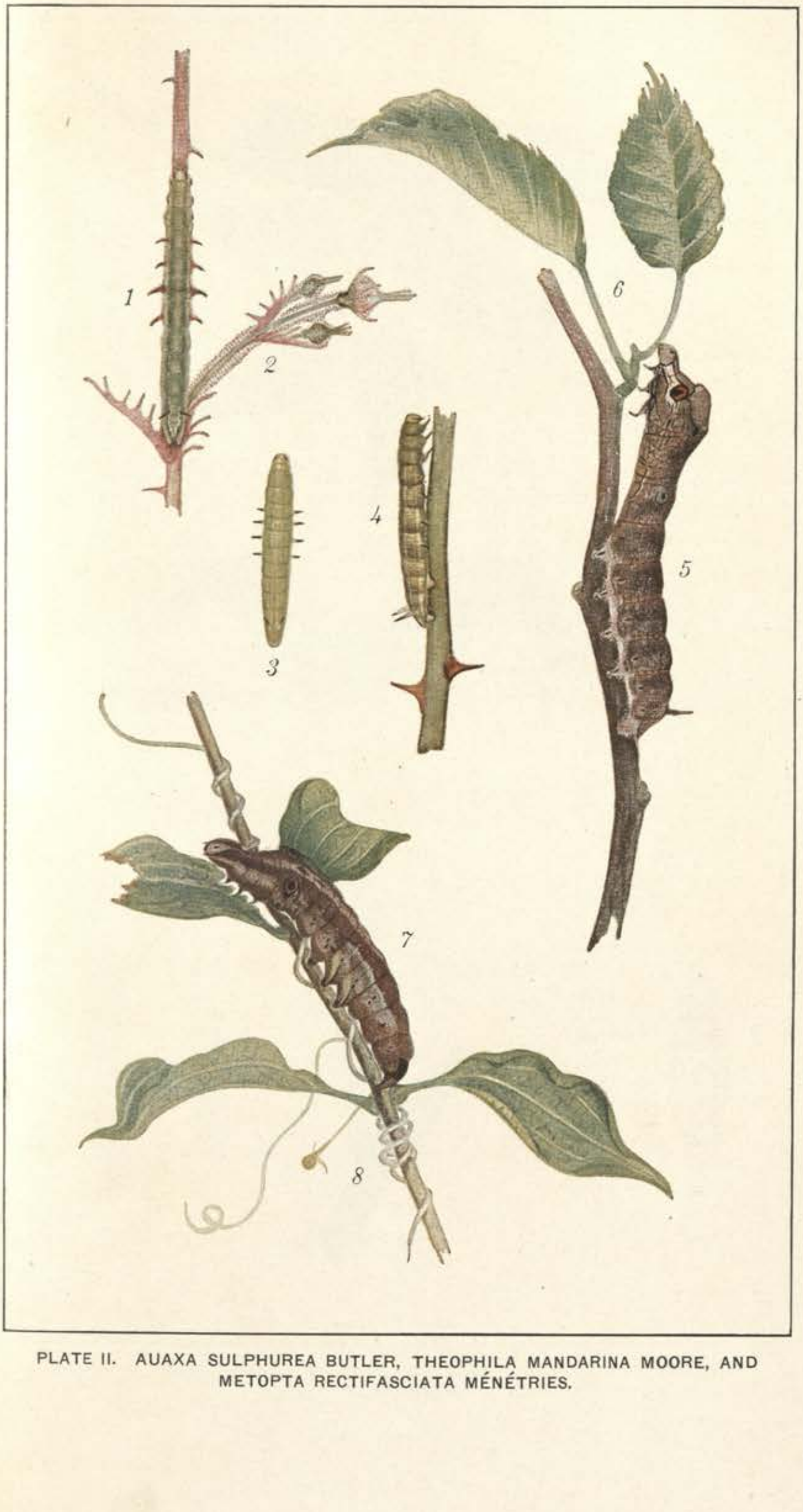

PLATE II. AUAXA SULPHUREA BUTLER, THEOPHILA MANDARINA MOORE, AND METOPTA RECTIFASCIATA MÉNÉTRIES.

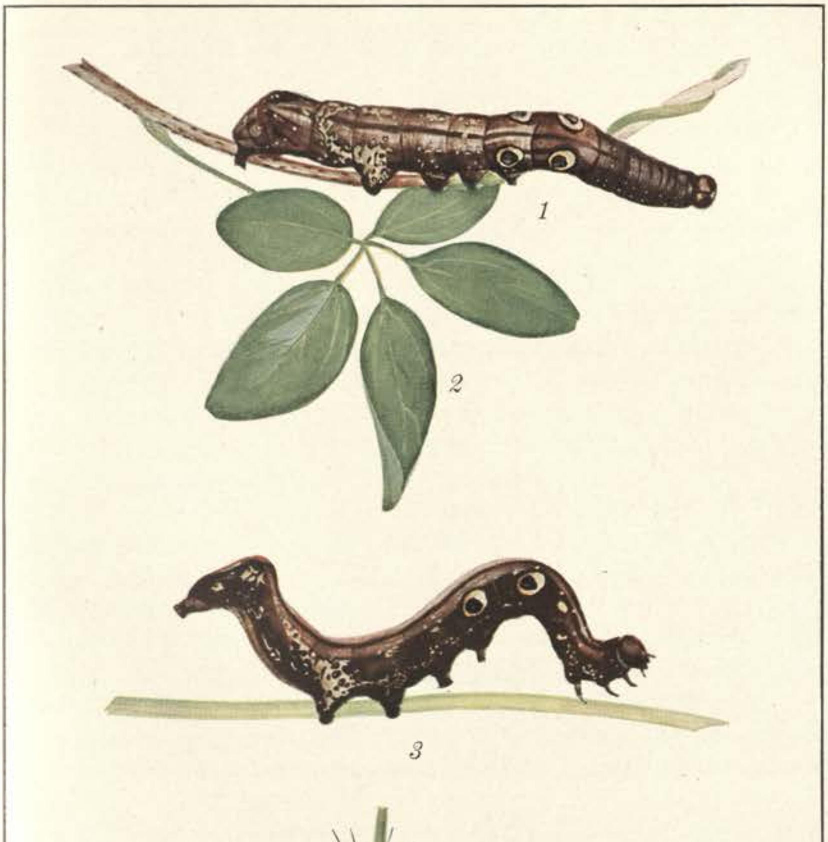

PLATE III. OPHIDERES TYRANNUS GUENÉE AND ELCYSMA WESTWOODII VOLLENHOVEN.

REVIEW OF THE PHILIPPINE MEMBRACIDÆ

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TWO PLATES AND 3 TEXT FIGURES

INTRODUCTION

The following study has been made with the view of bringing up-to-date the knowledge of those forms of the family Membracidæ known to occur in the Philippine Islands. This group of homopterous insects, so remarkable for the unusual and peculiar development of the pronotum, is well represented in the fauna of the Islands and, indeed, from this region have emanated some of the most bizarre of the species.

The extensive and careful collecting of Professor C. F. Baker, of Los Baños, has made it possible to recognize practically all of the species hitherto described, as well as a few forms which are apparently new. These are here reviewed and classified with the hope that they may be made more easily recognizable. The synoptic tables given are admittedly artificial, but it is believed that these keys, based on easily determined structures, even though perhaps unnatural, will make it possible for the student to recognize all of the species known to the Islands at the present time.

This paper is in no sense monographic and is intended merely as a preliminary contribution toward a more thorough study of the local forms of the family. A brief discussion of each species is given in cases in which the species has been recognized, and a summary is given of the original description of those species which have not been taken in recent years.

I am greatly indebted to Professor Baker, who has very kindly sent me practically all of the material on which this study is based and whose excellent collecting has made the work possible.

SUBFAMILIES OF THE MEMBRACIDÆ

Six subfamilies are recognized in the Membracidæ, and these may be separated as follows:

Key to the subfamilies.

a^1. Scutellum wanting or entirely concealed by the pronotum.
  b^1. Tarsi of equal length or the posterior pair longest.
    c^1. Anterior tibiæ foliaceous .... **Membracinæ.**
    c^2. Anterior tibiæ simple.

d^1. Apical cell of tegmen not petiolate .... **Darninæ.**
d^2. Apical cell of tegmen petiolate, the adjacent cells touching before it.
  e^1. Tegmina opaque, veins not distinguishable................ **Tragopinæ.**
  e^2. Tegmina membranous, veins distinct................................ **Smiliinæ.**
b^2. Posterior tarsi very short, much shorter than anterior or intermediate .... **Hoplophorinæ.**
a^2. Scutellum present and usually, but not always, uncovered...... **Centrotinæ.**

DISTRIBUTION AND CHARACTERS OF THE CENTROTINÆ

It is interesting to note that only one of these subfamilies—the Centrotinæ—is represented in the species thus far taken in the Islands.[1] This subfamily is the dominent subfamily in the East Indies and the Orient, but other subfamilies are found in India and in Australia and may appear in the Philippine fauna, in which case the above table will be available.

The presence of the scutellum, which is the subfamily character, can sometimes be determined only by dissection, but in most cases this structure is plainly visible at the sides or just beneath the posterior process of the pronotum. In all cases the pronotum is greatly developed, completely covering the mesonotum and the metanotum in the adult insect. The anterior pronotum is often produced in horns and spines, the function of which is conjectural.

HISTORICAL AND BIBLIOGRAPHICAL

Most of the species found in the Islands were described by Walker, Stål, Buckton, and Distant. Walker's descriptions are most unsatisfactory, and some of his species will, perhaps, be located only by reference to type material. Stål's work is so excellent as to need no comment; his genera and species are evidently the result of careful study and should be recognized if found. Buckton's contribution to the Philippine faunal literature is negligible, but his species must remain in the synonymy until they can be definitely located. Distant's descriptions are uniformly excellent and his figures good, but his types are from British India, and his species cannot perhaps be placed with absolute certainty from Philippine material, although it seems that one or two are identical.

In the bibliography which is given for each species it has been necessary greatly to abbreviate the titles and references, which in some cases are of considerable length. To supplement this, a complete bibliography of all of the references cited is given at the end of the paper.

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[1] Buckton has described two species of the subfamily Membracinæ as noted later in the text, but it seems inadvisable to recognize them here from the evidence at hand.

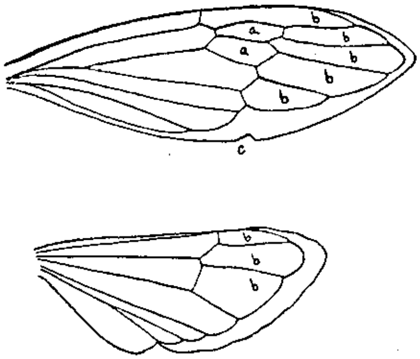

FIG. 1. Fore and hind wings of *Tricentrus fairmairei* Stål. *a*, discoidal cells; *b*, apical cells; *c*, internal angle.

NOMENCLATURE

Some of the terms mentioned in the following descriptions and a few of the characters used in the generic and specific diagnoses are more or less peculiar to the family and should perhaps be briefly explained. The term tegmina is used throughout for the forewings, following Stål, Fowler, Goding, Van Duzee, and other authors. In this wing the discoidal areas (the inclosed cells in the center of the wing) and the terminal or apical areas (the cells reaching the apical margin) are frequently used, but are not entirely reliable characters (fig. 1, *a* and *b*.) The clavus is the narrow posterior portion at the base of the tegmen which is next to the scutellum when the wing is closed. The internal angle of the tegmen is the angle made by the union of the clavus with the corium at the internal margin, usually about two thirds of the distance from the base to the tip (fig. 1, *c*). The terminal areas of the hind wings have proved valuable taxonomic characters, but unfortunately are hard to determine in dried specimens without relaxation. If the specimen is fresh, however, no difficulty is experienced in the use of this character, and even in dried specimens the tegmen may usually be lifted far enough to expose the tip of the underwing without damage to the insect. The sides of the pronotum above the eyes are usually swollen or produced into humeral angles (fig. 2, *a*). Above these angles arise the suprahumeral horns (fig. 2, *b*). The front of the pronotum between the suprahu-

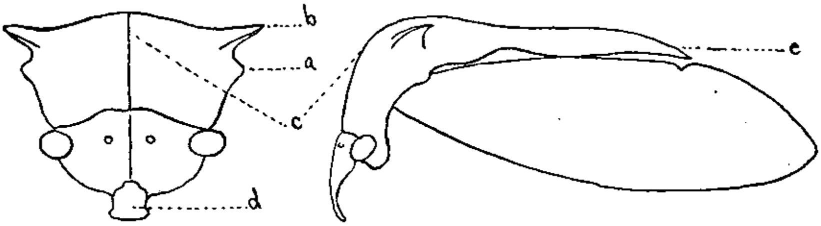

FIG. 2. Front and lateral outline of *Tricentrus fairmairei* Stål. *a*, humeral angles; *b*, suprahumeral horns; *c*, metopidium; *d*, clypeus; *e*, posterior process.

meral horns has been termed the metopidium (fig. 2, *c*).[2] Along the median dorsal line of the pronotum is often a distinct ridge, the dorsal carina, which is generally present on the posterior process, if not percurrent. The posterior extension of the pronotum, which often reaches beyond the tip of the abdomen and sometimes beyond the apex of the tegmen, is known as the posterior process (fig. 2, *e*). The relative position of the ocelli and the eyes is a character which is of value for specific, if not for generic, diagnosis. The clypeus (fig. 2, *d*) in the Membracidæ is the sclerite just below the median line of the vertex and is usually distinct; the labrum below it is much reduced and generally flattened against the body, so that it is not visible from a front view, thus giving the clypeus a labial appearance. The posterior trochanters in some genera show a curious row of teeth along their internal margin (fig. 3). This character is often somewhat difficult to verify, but is most valuable. The tibiæ of the forelegs are occasionally flattened or foliaceous (always so in the subfamily Membracinæ), and usually spined. The presence of punctures and pubescence is used in specific descriptions.

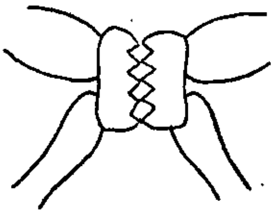

FIG. 3 Armed posterior trochanters.

LIST OF SPECIES

The following check list includes all of the species of the subfamily Centrotinæ described from the Islands to date:

Centrochares horrificus Westw.
Pyrgonota bifoliata Westw.
Pyrgonota tumida Stål.
Pyrgonota philippina Stål.
Pyrgonota bifurca Stål.
Pyrgonota semperi Stål.
Pyrgonota pinguiturris sp. nov.
Leptobelus dama Germ.
Lobocentrus zonatus Stål.
Dograna falco Buckt.
Leptocentrus taurus Fabr.
Leptocentrus leucaspis Walk.
Leptocentrus reponens Walk.
Leptocentrus aduncus Buckt.
Emphusis bakeri sp. nov.
Sertorius erigens Walk.
Periaman brevifrons sp. nov.
Tricentrus convergens Walk.
Tricentrus fairmairei Stål.
Tricentrus capreolus Walk.
Tricentrus pilinervosus Funkh.
Tricentrus plicatus sp. nov.
Tricentrus attenuatus sp. nov.
Centrotus magellani Fairm.
Centrotus dilatatus Walk.
Centrotus torcus Buckt.
Sipylus crassulus Stål.
Sipylus nodipennis Funkh.
Centrotoscelus typus Funkh.
Ebhul carinatus sp. nov.
Gargara luconica Fairm.
Gargara pygmaea Walk.
Gargara patruelis Stål.
Gargara varicolor Stål.

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[2] Cf. Van Duzee, E. P., Studies in North American Membracidæ. *Bull. Buffalo Soc. Nat. Sci.* (1908), 9, 30.

Gargara pulchripennis Stål.
Gargara nigrofasciata Stål.
Gargara tuberculata Funkh.
Gargara luteipennis Funkh.
Gargara nitidipennis Funkh.
Gargara nigrocarinata Funkh.
Gargara brunnea Funkh.
Gargara trifoliata Funkh.
Cryptaspidia pubera Stål.
Cryptaspidia tagalica Stål.
Cryptaspidia impressa Stål.
Cryptaspidia obtusiceps Stål.

Key to the genera of the Centrotinæ.

- a^1. Tibiæ more or less foliaceous; sides of thorax armed with two teeth.
  - b^1. Two suprahumeral horns; posterior process bilobed.......... **Centrochares.**
  - b^2. Single dorsal horn, often bilobed at tip; posterior process simple. **Pyrgonota.**
- a^2. Tibiæ simple; sides of thorax unarmed.
  - b^1. Hindwings with four apical areas.
    - c^1. Pronotum highly discally elevated; suprahumeral horns absent.
      - d^1. Posterior process simple and gradually acute.................. **Leptobelus.**
      - d^2. Posterior process lobate.. **Lobocentrus.**
    - c^2. Pronotum not highly discally elevated; suprahumeral horns present.
      - d^1. Posterior pronotal process connected with scutellum by a perpendicular prolongation .... **Dograna.**
      - d^2. Posterior pronotal process without prolongation below.
        - e^1. Posterior process distant from scutellum................. **Leptocentrus.**
        - e^2. Posterior process touching scutellum or very close to it.
          - f^1. Pronotum high and gibbous before base of posterior process.
            - g^1. Suprahumeral horns in a continuous line with the anterior margin of pronotum.. **Emphusis.**
            - g^2. Suprahumeral horns diverging from line of anterior margin of pronotum... **Sertorius.**
          - f^2. Pronotum not raised above base of posterior process, but in a continuous line with it... **Periaman.**
  - b^2. Hindwings with three apical areas.
    - c^1. Suprahumeral horns present.
      - d^1. Hind trochanters armed with teeth.................................. **Tricentrus.**
      - d^2. Hind trochanters unarmed... **Centrotus.**
    - c^2. Suprahumeral horns absent.
      - d^1. Hind trochanters armed with teeth.
        - e^1. Body about as wide as long; lateral angles prominent... **Sipylus.**
        - e^2. Body much longer than wide; lateral angles not prominent. **Centrotoscelus.**
      - d^2. Hind trochanters not armed.
        - e^1. Posterior process strongly sinuate... **Ebhul.**
        - e^2. Posterior process not strongly sinuate.
          - f^1. Body robust; size small.. **Gargara.**
          - f^2. Body slender; size larger.. **Cryptaspidia.**

Genus CENTROCHARES Stål

Centrotus FABR. (in part); *Oxyrhachis* GERM. (in part); *Pterygia* DELAP. (in part); *Notocera* A and S. (in part).

The genus *Centrochares* was erected by Stål in 1866,[3] but no species was mentioned as belonging to the genus. The generic characters may, however, be deduced from the table given to be as follows: Bilobed posterior process, foliaceous tibiæ, sides of thorax armed with spines, horns present above lateral angles. Later in the same year [4] Stål designates as the type of the genus Westwood's old species (*Centrotus*) *horrificus*, which Walker had incorrectly placed in DeLaporte's genus *Pterygia* of the subfamily Membracinæ.[5] In the Hemiptera Philippinarum [6] this species is given as the only species in the genus. The genus has remained monotypic.

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[3] Hemiptera Africana (1866), 4, 86.

The single species of the genus bears a strong superficial resemblance to the forms of the genus *Pterygia*, but may immediately be distinguished by the well-developed and plainly visible scutellum, which places it at once in another subfamily. The genus may be characterized not only by the foliaceous tibiæ and toothed thorax as described by Stål, but also by the most remarkable development of curious spines and tubercles over the surface of the pronotum. These bristling spines are of various shapes, lengths, and colors and give to the insect a decidedly terrifying aspect.

Centrochares horrificus Westw. Plate I, fig. 1.

Centrotus horrificus WESTW., Proc. Zool. Soc. (1837), 130; GUÉR., Mag. Zool. (1841), II, 3, Pl. 82; LEFEBVRE, Bull. Ann. Soc. Fr. (1842), 21.
Pterygia horrificus WALK., List Hom. Brit. Mus. (1851), 500; (1852), 4, Tab. 4, figs. 4 and 5.
Centrochares horrificus STÅL, Analect. Hem. (1866), 386; STÅL, Hem. Phil. (1870), 731; BUCKT., Mon. Memb. (1903), 266; FUNKH., Journ. Ent. & Zool. (1914), 6, 69.
Pterygia horrifica BUCKT., Mon. Memb. (1903), 73, Pl. XII, fig. 5.
Pterygia postica BUCKT., Mon. Memb. (1903), 70, Pl. XI, figs. 4–5a.
Pterygia spinula BUCKT., Mon. Memb. (1903), 73, Pl. XII, fig. 4.

Centrochares horrificus is readily distinguished from all other membracids thus far described from the Islands on account of the peculiar bristling spines, which are not found on any other species. The insects vary considerably in size and color. The males are usually smaller and darker than the females.

I believe Buckton's two Philippine species, *Pterygia postica* [7] and *Pterygia spinula*,[8] are both *Centrochares horrificus*. It seems incredible that the subfamily Membracinæ should be represented in the Islands by these two species only, and it is more than likely that Buckton followed Walker's error in assigning his insects to the wrong genus. I have specimens of *C. horrificus* which conform to Buckton's descriptions and figures for his supposed new species.

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[4] *Ber. ent. Zeitschr.* (1866), 10, 386.

[5] Cat. Hom. Brit. Mus. (1851), pt. II, 500.

[6] Stål, *Oefver. Kongl. Vet. Akad. Forh.* (1870), 731.

[7] Mon. Memb. (1903), 70.

[8] Ibid., 73.

Centrochares horrificus, once examined, will not be readily confused with other species, and the following brief description will, I believe, suffice to assure its recognition:

Female.—Ferruginous with yellowish spines. Suprahumeral horns long, spreading, flattened, much swollen at tips. Pronotum with sudden elevation just above scutellum. Posterior process reaching extremities of tegmina with high, swollen, bilobed elevation before the tip.

Head long, subfoliaceous, dark ferruginous, finely punctate, very slightly pubescent, median line smooth; clypeus twice as long as wide, obovate, bearing on each side two yellow tubercles; eyes large, translucent white with brownish fascia, bordered internally with a row of four or five whitish yellow tubercles; ocelli elevated, transparent, nearer to the eyes than to each other, situated above a line passing through center of eyes, bordered internally with three or four white tubercles. Pronotum ferruginous mottled with black; deeply punctate, sparingly pubescent, covered with irregular whitish yellow spines; humeral angles prominent; suprahumeral horns long, high, spreading, flattened, tips swollen, more or less triquetrous, marked with irregular flattened areas, tubercular; median ridge sharp, distinct, percurrent, closely tubercled; metopidium rounded; median region above scutellum in a rounded elevation; posterior elevation twice as high as median, bilobed, rough, marked in flattened areas; tip of posterior process blunt. Scutellum distinct, strongly bifid. Tegmina opaque, sordid ferruginous marked with black; base somewhat punctate; tip dark. Underside of body dark brown. Sides of meta- and mesothorax bearing teeth.

Legs light brown; tibiæ much flattened, tuberculate; tarsi yellow-brown.

Length, 5 to 6 mm.; width between extremities of pronotal horns, 4 to 5 mm.; width between bases of pronotal horns, 0.5 to 1 mm.

Male.—Dull black with yellowish spines. Tegmina brown-black, light transparent area just below posterior elevation of pronotum. Body very rough, punctured. Underparts of body, base of legs, and femora black; tibiæ and tarsi light brown.

Length, 3.5 to 5 mm.; width between extremities of pronotal horns, 2 to 3.5 mm.; width between bases of pronotal horns, 0.4 to 0.9 mm.

Philippine Islands (Westwood, Walker, Stål, Buckton); LUZON, Los Baños, Mount Banahao (*Baker*).

Genus PYRGONOTA Stål

Centrotus FABR. (in part); *Smilia* GERM. (in part); *Hypsauchenia* GERM. (in part).

Pyrgonota, according to its author, is to be separated from the old genus *Hypsauchenia* of Germar chiefly by the lack of a dorsal lobe on the posterior process. Schmidt [9] does not recognize this as a generic distinction, and it is indeed doubtful whether the genus will stand as new species are added. For the present, however, since the Philippine forms may be thus arbitrarily grouped, it seems desirable to accept the genus tentatively for the sake of convenience.

Stål designates no type species, but the logical choice falls on *P. bifoliata* Westw., both on account of its abundance—all of the other species are apparently rare—and because it has long been known and figured in literature. All of the species of this genus are native to the Islands.

The following key, adapted from that of Stål, will enable the student to separate the species:

Key to the species of Pyrgonota.

a^1. Posterior process of thorax without lateral carinæ.
  b^1. Posterior process uniformly colored.
    c^1. Posterior process depressed and gradually slender behind middle.
      d^1. Anterior process ridged; tegmina with pale spot .... tumida.
      d^2. Anterior process not ridged; tegmina concolorous .... pinguiturris.
    c^2. Posterior process acutely tectiform behind middle .... philippina.
  b^2. Posterior process with large pale spot before middle .... bifoliata.
a^2. Posterior process of thorax with lateral carinæ.
  b^1. Posterior process gradually acuminate and concolorous .... bifurca.
  b^2. Posterior process higher behind than before the middle; marked with a pale spot .... semperi.

Pyrgonota bifoliata Westw. Plate I, fig. 2.

Centrotus bifoliatus WESTW., Proc. Zool. Soc. (1837), 130.
Smilia bifoliata WESTW., Guér. Mag. Zool. (1841), II, 3, Pl. 83; LEFEBVRE, Bull. Ann. Soc. Fr. (1842), 21.
Hypsauchenia westwoodi FAIRM., Rev. Memb. (1846), 521, Pl. 7, figs. 6–8; WALK., List Hom. Brit. Mus. (1851), 631; BUCKT., Mon. Memb. (1903), 211, Pl. 46, figs. 6, 6a.
Hypsauchenia bifoliata FAIRM., Rev. Memb. (1846), 521; SCHMIDT, Stett. Ent. Zeitg. (1906), 370.
Hypsauchenia bifasciata WALK., List Hom. Brit. Mus. (1851), 631.
Pyrgonota bifoliata Stål, Hem. Phil. (1870), 731; BUCKT., Mon. Memb. (1903), 270; FUNKH., Journ. Ent. & Zool. (1914), 6, 67.

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[9] *Stett. ent. Zeitg.* (1906), 67, 370.

Pyrgonota bifoliata is a most bizarre species, recalling in general outline *Hypsauchenia hardwickii* Kirby, but with the anterior horn straighter and without the posterior elevation. Its frequent mention in literature makes its identification comparatively easy.

Chocolate-brown with broad whitish yellow patch covering middle of posterior process and extremity of this process darker. Pronotum and exterior basal area of tegmen broadly punctured and sparingly pubescent, the punctures separated by reticulated ridges, which form a network of polygonal areas. Pronotal horn very high, gradually narrowing to point of branching; two-branched at extremity, the branches spreading and flattened at tips. Posterior process tectiform. Entire posterior margin of pronotal horn armed with fine spines, these spines extending down over dorsal margin of posterior process and gradating into serrate teeth at extremity. Tegmina brown and opaque, exterior margin wavy; hindwings transparent, veins brown. Tibiæ foliaceous.

Length, head to tip of tegmen, 6 to 7 mm.; height of pronotal horn to point of branching, 5 mm.; length of branches of pronotal horn, 5 mm.

Philippine Islands (Westwood, Fairmaire, Walker, Stål, Buckton); LUZON, Los Baños (*Baker*).

Pyrgonota tumida Stål.

Pyrgonota tumida STÅL, Hem. Phil. (1870), 730; BUCKT., Mon. Memb. (1903), 270.

Black; head and thorax distinctly punctate. Dorsal process high, above the middle gradually becoming slender, strongly thickened at apex, both anterior and posterior margin bearing a single ridge, the sides three-ridged; the posterior carina slightly denticulate, the teeth continuing upon the posterior process. The posterior process gradually slender as seen from a side view, behind the middle subdepressed. Tegmina marked with a small, pale spot before the apex of the clavus. Feet flavotestaceous.

Length, 8 mm.; width, 2.2 mm.

Described by Stål from the male only.

Philippine Islands (Stål).

Pyrgonota philippina Stål.

Pyrgonota philippina STÅL, Hem. Phil. (1870), 730.

Pitchy black; thorax strongly punctate. Dorsal process high, straight, leaning more or less forward, slightly recurved toward apex, gradually becoming slender; anterior and posterior unicarinate, the sides with two or three carinæ; apex somewhat thick, truncate, and compressed anterior-posteriorly; carinate, the posterior carina minutely denticulate and extending upon the posterior process. Posterior process acutely tectiform, subcompressed. Tegmina with pale spot before apex of clavus. Hindwings vitreous. Feet flavous-pitchy.

Length, 8 mm.; width, 2.2 mm.

Described by Stål from the female only.

Philippine Islands (Stål).

I am inclined to think that this is the female of *P. tumida*, but am recognizing it tentatively, pending an opportunity to examine more specimens.

Pyrgonota bifurca Stål.

Pyrgonota bifurca Stål, Hem. Phil. (1870), 731.

Piceous; head slightly punctate, thorax strongly punctate. Dorsal process varying in length, gradually becoming slender and leaning somewhat forward; anterior and posterior margins unicarinate, sides with two carinæ; apex with two slender triquerate processes, strongly diverging and slightly curving, compressed-ampliate in the middle. Posterior carinæ spiny, continuing on the posterior process. Posterior process acutely tectiform, narrow as seen from the side. Feet concolorous.

Length, 7.5 mm.; width, 2 mm.

Philippine Islands (Stål).

Pyrgonota semperi Stål.

Pyrgonota semperi Stål, Hem. Phil. (1870), 731.

The species noted by Stål as "*C. Semperi*" in his work on the Philippine Hemiptera has never been recognized and is known only through his short description, which follows that of *P. bifurca* and is as follows:

> Praecedenti maxime affinis, differt processu postico thoracis ante medium macula pallescente notato, pone medium quam anterius altiore, tegminibusque totis piceis. ♀ Long. 7, lat. 2 mill.

I have included this species in the preceding key, with the specific distinctions as indicated, in the hope that future collecting may lead to its identification.

Pyrgonota pinguiturris sp. nov. Plate I, fig. 3.

Pyrgonota pinguiturris is apparently near *P. tumida* Stål, but differs in being without carinæ on its pronotum and lacking the spot on the tegmina.

Ferruginous; rough; densely, coarsely, and deeply punctate; sparingly pubescent. Dorsal horn thick and heavy, uniformly cylindrical, somewhat swollen at apex with the suggestion of lateral processes at the tip. Posterior process gradually acuminate, slightly depressed at tip, extending just beyond extremity of abdomen. Tegmina uniformly opaque ferruginous; pointed at tips. Tibiæ broadly foliaceous.

Head subtriangular, longer than broad, finely and densely punctate, finely pubescent; eyes large, brown, extending halfway to lateral angles of pronotum; ocelli small, translucent, farther from each other than from the eyes and situated above a line passing through center of eyes; clypeus broader than long, trilobed, middle lobe longest, pubescent at tip. Pronotum uniform brown, very rough, coarsely punctate, very sparsely pubescent; dorsal horn cylindrical, of almost uniform thickness, inclining strongly forward, without anterior, posterior, or lateral carinæ, tip swollen and rounded above, on either side of tip a very slight lateral protuberance; lateral angles not prominent; scutellum distinct, bifurcate; posterior process slender, gradually acuminate, triquetrous, the roughly defined dorsal ridge giving it a tectiform appearance, extending just beyond the internal angles of tegmina. Tegmina opaque, strongly punctate over entire basal and costal areas, veins indistinct, tip pointed. Undersurface of body chocolate-brown; legs and feet ferruginous; tibiæ swollen and foliaceous. Type, female.

Length, head to tip of tegmina, 6.5 mm.; length of pronotal horn, 4 mm.; width between humeral angles, 2 mm.

LUZON, Mount Maquiling (*Baker*).

Genus LEPTOBELUS Stål

Centrotus FABR. (in part).

Leptobelus was erected by Stål in 1866[10] for the reception of those species of the subfamily Centrotinæ in which the tibiæ were simple, sides of breast unarmed, hindwings with four apical areas, exterior discoidal area of tegmina petiolate, and disk of thorax elevated, bearing posterior process high above the body.

In this genus the prothorax rises in a high column, which gives off at its summit two lateral horns and the posterior process, the latter being distinctly raised above the abdomen and usually subparallel to it. The scutellum is longer than broad, with the tip more or less truncate. Only one species of the genus has been reported from the Islands.

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[10] Hem. Afr. (1866), 4, 86.

Leptobelus dama Germ. Plate I, fig. 4.

> *Centrotus dama* GERM., Rev. Silb. (1835), 258, Pl. 3, fig. 14; FAIRM., Rev. Memb. (1846), 510; WALK., List Hom. Brit. Mus. (1851), 602.
> *Leptobelus dama* STÅL, Berl. Ent. Zeitschr. (1866), 386; STÅL, Bid. Memb. Kan. (1869), 284; ATKINS., Journ. Asiat. Soc. Beng. (1885), 54, 81; DIST., Fauna Brit. Ind.—Rhynch. (1907), 4, 15, fig. 11; LEFROY, Ind. Ins. Life (1909), 729, fig. 504; BANKS, Phil. Journ. Sci., Sec. D (1910), 5, 47.

Leptobelus dama is apparently common throughout India and the East Indies. Professor Baker has sent me specimens from Palawan, and Banks has also reported it from the Islands. The species has been so often described and figured that further description is unnecessary, except for convenience in comparison should other species of the genus be found.

Shining black; densely punctate; base of scutellum and sides of breast gray pilose; tegmina translucent bronze with prominent brown veins; hind tibiæ very spiny. Lateral branches of pronotal horn long, sharp, slightly curving backward. Posterior process rising high above scutellum and gradually curving downward until it almost touches tegmina midway between internal angle and tip; this process sharply carinate above.

India (Fairmaire, Stål, Lefroy); East Indies (Walker); Java (Distant); PALAWAN, Puerto Princesa (*Baker*).

Genus LOBOCENTRUS Stål

The genus *Lobocentrus* was erected[11] for the species *zonatus* described by Stål from the Philippine Islands in 1870. Neither the genus nor the species has since been mentioned in literature, with the exception of a catalogue reference by Buckton as listed below. The genus is, however, well described and clearly defined, and its validity has never been questioned. It is apparently close to *Leptobelus* and is to be distinguished from that genus, according to the author, by the difference in position of ocelli, the lobe of the posterior process, and the number of discoidal areas in the tegmina.

Lobocentrus zonatus Stål.

> *Lobocentrus zonatus* STÅL, Hem. Phil. (1870), 728; BUCKT., Mon. Memb. (1903), 268.

The following brief summary of the specific characters as listed by Stål may aid the student in recognizing *Lobocentrus zonatus*.

Black; distinctly punctate; head, thorax, and scutellum sparsely sericeous with golden-flavous pubescence, the sides of the breast very densely sericeous in the same manner. Tegmina obscure wine-colored, a translucent fascia before the middle and the veins fuscous; base black and punctate. Prothorax with percurrent median ridge; lateral horns extending outward and slightly curving backward, slender, gradually acuminate, bisulcate above; posterior process lobed, acutely tectiform.

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[11] Hem. Phil. (1870), 727.

Described from the female.

Length, 8 mm.; width, 3.5 mm.

Philippine Islands (Stål).

I have never seen a specimen of this species and have not been able to learn whether or not the type is available for study. It would seem, however, that the species should be recognized if found.

Genus **DOGRANA** Distant

Campylocentrus STÅL (in part).

Dograna is a very distinct genus, including those species in which the posterior process is united with the apex of the scutellum by a strong downward perpendicular prolongation. The suprahumeral horns are prominent; scutellum distinct and slightly longer than broad; posterior process curved. While the generic characters are more or less artificial, they are convenient in studying this rather confusing group of the Membracidæ. The genus was erected by Distant in 1907[12] and placed by him in his division *Acanthophyesaria*. The genus contains at present but two species, one of which is native to the Philippines.

Dograna falco Buckt.

Campylocentrus falco BUCKT., Mon. Memb. (1903), 243, Pl. 56, figs. 2, 2a.

Dograna falco DIST., Fauna Brit. Ind.—Rhynch. (1907), 4, 24.

Apparently rare. I have seen one specimen bearing the locality label "Malinao." This specimen may be described as follows:

Very dark brown, almost black; thickly and roughly punctured; pilose with scattered golden hairs, particularly on scutellum and sides of mesothorax. Suprahumeral horns subtriquetrous, extending almost directly outward, very slightly upward and backward. Posterior process extending beyond internal angle of tegmina, connected to scutellum by downward prolongation; dorsal carinæ high and sharp; tip gradually acuminate. Tegmina vitreous, wrinkled, black and punctate at base. Undersurface of body and legs very dark brown; femora swollen; tibiæ finely spined; tarsi ferruginous. Female.

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[12] Fauna of British India—Rhynchota (1907), 4, 24.

Length, 9 mm.; width between extremities of pronotal horns, 5.8 mm.

I believe this to be Buckton's species, though it is slightly larger than the specimen he describes. The habitat given by that author is Luzon, Philippine Islands. There was no date label nor further locality name on the specimen which I was permitted to examine.

Genus LEPTOCENTRUS Stål

Membracis Fabr. (in part); *Centrotus* Fabr. (in part).

Leptocentrus is an old and well-established genus,[13] including those forms in which the posterior process is well elevated above the body but does not bear a lobe below. The hind wings have four apical areas and the tegmina five apical and two discoidal. The suprahumeral horns are strong and usually widespreading. The genus is well represented in Africa and India; four species have been reported from the Philippines. These may be separated as follows:

Key to the species of Leptocentrus.

a^1. Posterior process short, not extending as far as the internal angle of tegmina .... aduncus.
a^2. Posterior process extending beyond internal angle of tegmina.
  b^1. Suprahumeral horns extending strongly upward........ leucaspis.
  b^2. Suprahumeral horns almost horizontal.
    c^1. Front margin of suprahumeral horns flattened into subfoliaceous ridge .... reponens.
    c^2. Front margin of suprahumeral horns not flattened........ taurus.

Leptocentrus taurus Fabr.

Cicada taurus Linn., Gmel. Ed. Syst. Nat. (1740), 1, 3; (1767), 4, 14; Fabr., Spec. Inc. (1781), 2, 317; Fabr., Mant. Ins. (1787), 2, 264.
Membracis taurus Fabr., Syst. Ent. (1775), 676; Oliv., Enc. Méth. (1792), 7, 665; Fabr., Ent. Syst. (1794), 4, 14.
Membracis rupicapra Fabr., Ent. Syst. Suppl. (1798), 514.
Centrotus rupicapra Fabr., Syst. Rhyng. (1803), 18.
Centrotus taurus Fabr., Syst. Rhyng. (1803), 18; Germ., Rev. Silb. (1835), 3, 257; Blanch., Hem. (1840), 3, 182; Fairm., Rev. Memb. (1846), 510; Walk., List Hom. Brit. Mus. (1851), 602; Suppl. (1858), 158.
Membracis tricornis Hardw., Zool. Journ. (1828), 13; Hardw., Tabl. Suppl., Pl. 30, figs. c, d, f.
Centrotus terminalis Walk., List Hom. Brit. Mus. (1851), 604; Melich., Hom. Cey. (1903), 109.
Centrotus vicarius Walk., List Hom. Brit. Mus. (1851), 605.

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[13] Stål, Hem. Afr. (1866), 4, 87 and 90.

Leptocentrotus taurus STÅL, Hem. Afr. (1866), 4, 90; STÅL, Analect. Hem. (1866), 386; STÅL, Hem. Fabr. (1869), 2, 50; ATKINS., Journ. Asiat. Soc. Beng. (1885), 54, 85; GODG., Cat. Memb. N. Am. (1894), 477; BUCKT., Mon. Memb. (1903), 268; MELICH., Hom. Cey. (1903), 116; DIST., Fauna Brit. Ind. (1907), 4, 28; LEFROY, Ind. Ins. Life (1909), 731, 732; BANKS, Phil. Journ. Sci., Sec. D (1910), 5, 48.

Leptocentrus gazella BUCKT., Mon. Memb. (1903), 235, Pl. 53, fig. 5a.

Reported from the Philippine Islands by Banks as above. The large number of easily available references makes a description unnecessary. The species shows some slight variation in size, coloration, and position of pronotal horns when a large series is examined. Distant's figure[14] is typical. I have not seen Philippine material.

Assam, Calcutta (Atkinson); Tenasserim, Mytitta (Doherty); Borneo (Distant); Timor (Buckton); Philippine Islands (Banks); Ceylon (Melichar).

Leptocentrus leucaspis Walk.

Centrotus tauros (in part: error) WALK., List Hom. Brit. Mus. (1851), 602.

Centrotus leucaspis WALK., List Hom. Brit. Mus. Suppl. (1858), 158.

Leptocentrus leucaspis BUCKT., Mon. Memb. (1903), 235, Pl. 53, figs. 3, a, b; MELICH., Wien. Ent. Zeitg. (1905), 24, 294; DIST., Fauna Brit. Ind. (1907), 4, 30, fig. 25.

Black; roughly punctate; scutellum and sides of mesothorax densely pilose. Suprahumeral horns slender, triquetrous, extending upward, outward, and backward, well above dorsal line of pronotum; tips sharp. Posterior process tricarinate, arising well above scutellum and curving downward until it almost touches tegmina just behind internal angles. Tegmina vinaceous; veins somewhat obscure; base opaque and punctate. Legs and undersurface of body fuscous.

Length, 7 to 9 mm.; width between extremities of suprahumeral horns, 5 to 7 mm. The males are smaller and darker than the females.

British India and Philippines (Distant).

Leptocentrus reponens Walk. Plate I, fig. 6, *a* and *b*.

Centrotus reponens WALK., List Hom. Brit. Mus. (1851), 604; MELICH., Hom. Cey. (1903), 110.

Centrotus antilope STÅL, Freg. Eug. Resa, Ins. (1859), 284.

Leptocentrus antilope STÅL, Hem. Phil. (1870), 727.

Leptocentrus reponens ATKINS., Journ. Asiat. Soc. Beng. (1885), 54, 86; DIST., Fauna Brit. Ind. (1907), 4, 30; FUNKH., Journ. Ent. & Zool. (1914), 6, 69.

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[14] Fauna of British India—Rhynchota (1907), 4, 28, fig. 24.

Evidently the commonest of the Philippine species of this genus. Walker, Stål, and Distant have all recorded it from the Islands, and Professor Baker has sent me specimens collected at Los Baños.

Black; coarsely and deeply punctate; scutellum and sides of meso- and metathorax densely white tomentose; metopidium and lateral areas of pronotum covered with long yellowish pubescence. Head broader than long, densely pilose, finely punctate; clypeus trilobed, longer than wide; eyes prominent, light brown; ocelli translucent, equidistant from each other and from the eyes, and situated on a line passing through center of eyes. Disk of pronotum thick, heavy, and cylindrical; suprahumeral horns flattened, front margin subfoliaceous, tips suddenly acute; these horns extending outward and backward, almost horizontal, not rising above highest point of posterior process. Posterior process arising from top of posterior region of pronotal disk, gradually sloping downward but not touching tegmina; slender, almost uniform in thickness, triquetrous, tip gradually acuminate. Tegmina hyaline with broad, well-defined brown veins; base very slightly punctate and somewhat pilose. White tomentose metathorax usually showing through base of wings. Undersurface of body, legs, and feet black.

Length, 8 mm.; width between extremities of pronotal horns, 6.5 to 7 mm.

Tenasserim, North Bengal (Walker); Sumatra (Distant); Philippine Islands (Walker, Stål, Distant); LUZON, Los Baños (*Baker*).

Leptocentrus aduncus Buckt.

Leptocentrus aduncus BUCKT., Mon. Memb. (1903), 236, Pl. 53, fig. 6.

This species has not been recorded since Buckton's original description, and it seems doubtful if it can be recognized from his short description and poor figure. It apparently may be distinguished only by the short horns and the short and auriculate posterior process as represented in his plate. Buckton's description follows:

> Dark fuscous, shining and punctured. Suprahumerals short and auriculate. Posterior horn stout at base and short. Tegmina fuscous. Frons hairy. Size 6 x 5 mm. Habitat-Luzon, Philippine Isles.

Genus EMPHUSIS Buckton

Centrotus FABR. (in part); *Centrotypus* STÅL (in part).

The genus *Emphusis* is peculiar in having been apparently incorrectly diagnosed by its author. Buckton states in his original description that in *Emphusis* the suprahumeral horns are absent.[15] Distant, however, who presumably had Buckton's type before him, states that the suprahumeral horns are well developed but directed subhorizontally and recurved apically.[16]

The genus is close to *Centrotypus*, but differs in having the anterior part of the pronotum much more elevated and swollen and in having the anterior margin of the suprahumeral horns in a continuous line with the semicircular anterior margin of the metopidium. The hind wings have four apical areas, the tegmina five apical areas. To this genus must be assigned the following very remarkable species:

Emphusis bakeri sp. nov. Plate I, fig. 7, *a* and *b*.

Large, handsome, brilliantly marked. Head and pronotum black, the front of head, sides of metopidium, median dorsal area between pronotal horns, and lateral margin of pronotum as far as posterior process densely covered with snowy white tomentose excrescence. Pronotum rising thick and high with broad, widespreading suprahumeral horns. Dorsal margin of pronotum sloping roundly to posterior process, which is curved, decurrent, and extends to tips of tegmina. Tegmina black and punctate at base and costal margin; hyaline in middle; red bordered with brown at tip. The jet-black abdomen shows through the hyaline portion of the tegmina. Legs and feet fuscous-ferruginous. The marked contrast of the black, white, and red gives the insect a striking appearance. This is the largest membracid thus far reported from the Philippines.

Head longer than broad, black, deeply but not closely punctate; a broad, white, tomentose vertical band extending from base of head to extremity of clypeus and occupying the space between the ocelli the width of the clypeus; lateral margin of head strongly sinuate; eyes large, dark gray mottled with brown; ocelli pearly, much farther from each other than from the eyes and situated above an imaginary line extending through center of eyes; antennæ long and bristlelike; clypeus three-lobed, pilose. Pronotum strongly elevated, the disk appearing cylindrical from a front view, but extended posteriorly to form a subtriangular plate behind; suprahumeral horns arising from top of pronotum, subhorizontal, curving downward and backward to an extent which continues the line of the anterior margin of the pronotum; posterior process long, decurved, gradually acuminate, follow-

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[15] Mon. Memb. (1903), 256.

[16] Fauna of British India—Rhynchota (1907), 4, 36.

ing the curve made by the internal margin of the tegmina, sharply carinate above, two short lateral carinæ at base; dorsal carina percurrent from anterior base of pronotal horns to tip of posterior process. Tegmina long, somewhat narrow; black, opaque, deeply and regularly punctate, and sparingly pubescent at base; hyaline in middle; costal area for two thirds the length of the tegmen black and punctate; apical fourth red with smoky brown border; veins distinct, assuming the color of the part of the tegmen traversed. Undersurface of body black; abdomen black with segments bordered with yellow. Legs fuscous-ferruginous; femora somewhat swollen; tibiæ slightly foliaceous and covered with fine spines; tarsi flavous and spined; claws brown. Type, female.

Length, 10.5 mm.; width between extremities of pronotal horns, 8.6 mm.

MINDANAO, Iligan (*Baker*).

The type specimen bears Baker's duplicate No. 3115.

The male is smaller and darker and lacks much of the snowy white pubescence on the front and sides of the pronotum. The brown border on the tips of the tegmina is not so prominent.

Length, 8 mm.; width between tips of horns, 7 mm.

I take pleasure in dedicating this very interesting species to Professor C. F. Baker, through whose kindness I have been permitted to examine most of the species recorded in this study.

Genus SERTORIUS Stål

Centrotus FABR. (in part).

The standing of the genus *Sertorius* may be seriously questioned, but it is here included, pending further knowledge of the group. As diagnosed by Stål, the characters may be stated as follows: Posterior process present; tibiæ simple; underwings with four apical areas; exterior discoidal cell of tegmina never petiolate; posterior process touching scutellum; thorax strongly elevated; horns present above lateral angles; longitudinal ridge of thorax not elevated between lateral horns; lateral horns never compressed anteriorly and posteriorly; tegmina with five complete apical areas; sides of scutellum distinctly prominent; eyes slightly prominent; two interior longitudinal veins of corium joining transverse veins before the middle.[17]

According to this description the genus differs from *Centrotypus* Stål only by the presence of a cross vein at the base of the tegmen, a structure which both Goding[18] and Kirkaldy[19] have remarked as being of very doubtful value as a generic character.

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[17] Vide Stål, Hem. Afr. (1866), 4, 87.

Sertorius erigens Walk.

Centrotus erigens WALK., List Hom. Brit. Mus. (1851), 614.
Sertorius erigens STÅL, Hem. Phil. (1870), 727.

Black; head and pronotum roughly punctured. Head narrower than anterior pronotum, wider than long. Pronotum convex, slightly ridged, very deep in front, rising vertically from the head; lateral angles obtuse, not prominent. Suprahumeral horns broad, thick, prismatic, diverging, very slightly inclined backward and downward, as long as the space between them; sides conical, slightly and irregularly ridged, of almost equal breadth. Posterior process deep at base, slender and tapering toward apex, triquetrous, slightly curved, extending beyond tip of abdomen. Abdomen tinged with gray. Tegmina blackish brown along the borders, almost colorless in the middle, three fourths of costal border and base punctate. Hindwings almost colorless.

Length, 10 mm.; width between extremities of outstretched tegmina, 18 mm.

This description is adapted from Walker.

Philippine Islands (Walker, Stål).

Genus PERIAMAN Distant

Centrotus FABR. (in part).

A genus with species bearing a superficial resemblance to those of *Centrotus*, but at once distinguished by the four apical areas of the hind wings. Clypeus extending well below the margin of the head; pronotum convex; suprahumeral horns broad and transverse; posterior process equally as high and extending on a line with the dorsal margin of the metopidium, not extending beyond the internal angle of the tegmina. Tegmina broad with five apical areas. Femora and tibiæ simple.

Distant makes *P. flavolineatus* Buckt. the type of this genus.[20]

Periaman brevifrons sp. nov. Plate I, fig. 8, *a* and *b*.

Very dark brown, almost black; densely punctate, sparingly pubescent; pronotum almost vertical above head; dorsal margin continuing horizontally into the posterior process; suprahumeral horns short, thick, and heavy, compressed dorsoventrally, extending outward, very slightly upward and backward; posterior process robust at base, gradually narrowing, sharply carinate

[18] Mon. Aus. Memb. (1903), 27.
[19] *Bull. Haw. Sug. Pl. Assoc.—Hem.* (1907), 3, 90.
[20] Fauna of British India—Rhynchota (1907), 4, 37.

above; tegmina smoky hyaline, tips fuscous, extreme base black and punctate; legs ferruginous.

Head twice as broad as long, somewhat rugose, pubescent with golden hairs; eyes extremely large and prominent; ocelli translucent, much farther from each other than from the eyes and situated about on a line passing through center of eyes; face sharply emarginate before clypeus; clypeus longer than broad, distinctly set off from head, pubescent at extremity. Pronotum not greatly elevated, vertical above head, flat between horns, percurrent dorsal carina, dorsal line practically straight; humeral horns triquetrous, compressed, broad at base, tips sharp, almost flat above, extending almost directly outward, very slightly upward and backward; posterior process reaching just beyond internal angle of tegmina, stout at base, gradually acuminate, very slightly depressed in middle, tip faintly depressed, dorsal carina percurrent, a lateral carina on each side near margin. Scutellum distinct, pilose. Tegmina smoky hyaline, veins brown, a broad fuscous cloud at tip, base narrowly black and punctate; five apical and two discoidal areas. Hindwings iridescent hyaline, border clear and somewhat wrinkled. Undersurface of body black. Legs ferruginous brown; femora moderately swollen; tibiæ spined; tarsi flavous. Type, female.

Length, head to tip of tegmina, 7 mm.; width between extremities of horns, 3.6 mm.

PALAWAN, Puerto Princesa (*Baker*).

Genus **TRICENTRUS** Stål

Centrotus FABR. (in part); *Taloipa* BUCKT.

Tricentrus is a well-defined and easily distinguished genus. It is the only genus which shows both the suprahumeral horns and the spined posterior trochanters, the latter character appearing to be a very reliable and sufficient structure for diagnosis. These spines, or teeth, on the inner surface of the posterior trochanters are found also in the genera *Sipylus* and *Centrotoscelus*, but neither of these genera has suprahumeral horns. The function of such a structure is conjectural. The hind wings have three apical areas.

Four species have been described from the Philippines, all of which are recognizable from material at hand. These species, together with two herein described, may be separated as follows:

Key to the Philippine species of Tricentrus.

a^1. Suprahumeral horns at least twice as long as the distance between their bases .... convergens.

a.[2] Suprahumeral horns less than twice as long as the distance between their bases.
  b[1]. Suprahumeral horns not extending outward as far as extremities of humeral angles .... attenuatus.
  b[2]. Suprahumeral horns projecting laterally beyond humeral angles.
    c[1]. Posterior process curving downward, much depressed at tip.. capreolus.
    c[2]. Posterior process straight or nearly so.
      d[1]. Veins of tegmina thickly pilose.......... pilinervosus.
      d[2]. Veins of tegmina smooth or very sparsely pilose.
        e[1]. Areas of tegmina much wrinkled.......... plicatus.
        e[2]. Areas of tegmina smooth.......... fairmairei.

Tricentrus convergens Walk. Plate I, fig. 9, *a* and *b*.

Centrotus convergens WALK., List Hom. Brit. Mus. (1851), 623.
Tricentrus convergens STÅL, Hem. Phil. (1870), 728; DIST., Fauna Brit. Ind. (1907), 4, 53; FUNKH., Journ. Ent. & Zool. (1914), 6, 68.

Tricentus convergens is the type species of the genus, originally described from the Philippines by Walker and apparently not uncommon. It may be at once recognized by the very high and flattened, almost foliaceous, suprahumeral horns.

Ferruginous, finely punctate, sparingly pubescent, with sometimes a white tomentose area above and behind the eyes. Suprahumeral horns more than twice as long as the distance between their bases, projecting strongly forward and upward, subparallel, farther apart at their apices than at their bases, tips much rounded and flattened, not at all sharp; posterior process almost straight, tricarinate, dorsal carina high and sharp, extremity reaching just beyond internal angle of tegmina. Tegmina subhyaline, base brown and punctate. Undersurface of body dark brown. Legs ferruginous.

Length, from head to extremity of tegmen, 6 mm.; length of pronotal horns, 2 to 3 mm.; width between extremities of horns, 2 to 3 mm.

Philippines (Walker, Funkhouser); LUZON, Los Baños (*Baker*).

Tricentrus fairmairei Stål. Figs. 1 and 2.

Centrotus fairmairei STÅL, Freg. Eug. Resa, Ins. (1859), 284.
Tricentrus fairmairei STÅL, Analect. Hem. (1866), 387; STÅL, Hem. Phil. (1870), 728; DIST., Fauna Brit. Ind. (1907), 4, 58; FUNKH., Journ. Ent. & Zool. (1914), 6, 67.
Terentius fairmairei BUCKT., Mon. Memb. (1903), 271.
Taloipa tinctoria BUCKT., Trans. Linn. Soc. (1905), 9, 334, Pl. 22, fig. 4.

Tricentrus fairmairei is one of the abundant species of the genus as represented in the Islands. It may be recognized superficially by the reddish tinge over the entire body and tegmina.

Reddish brown, rather bright on posterior process and base of tegmina. Head almost twice as wide as long, obscurely and lightly punctate, irregularly pilose; clypeus projecting for half its length below inferior margin of face, margin slightly rimmed. Pronotum finely punctate, densely pubescent, almost perpendicular above head, strongly convex between horns; suprahumeral horns short, stout, triquetrous, extending almost directly outward, very slightly upward and backward, less than half as long as the distance between their bases; dorsal carina percurrent; posterior process slightly depressed at base, swollen before apex, dorsal carina high and sharp, extremity reaching internal angle of tegmina. Tegmina reddish smoky hyaline, base reddish brown or black and punctate. Legs and undersurface of body ferruginous brown.

The species shows a rather wide range of color, some specimens being much redder than others.

Length, 6 mm.; width between extremities of suprahumeral horns, 3.4 to 3.6 mm.

Bangalore (Buckton); Philippine Islands (Stål, Distant, Funkhouser); LUZON, Los Baños (*Baker*).

Tricentrus capreolus Walk. Plate II, fig. 10, *a* and *b*.

Centrotus capreolus WALK., List Hom. Brit. Mus. (1851), 627.
Tricentrus capreolus STÅL, Hem. Phil. (1870), 728.

A black, robust species, characterized by the rather long depressed posterior process. I have seen one specimen from the Islands, bearing duplicate No. 2650, collected at Mount Banahao by Professor Baker.

Black, finely and obsoletely punctured, sparsely covered with tawny pubescence. Pronotum much convex, projecting well above and before the suprahumeral horns as viewed from the side; suprahumeral horns short and rather blunt, not half as long as the distance between their bases; posterior process smooth, gradually curving, depressed at tip, extending well beyond internal angle of tegmina. Tegmina reddish hyaline, base black and punctate, veins brown, apical margin very slightly fuscous; a whitish patch on base of abdomen often showing through basal area. Undersurface of body black. Legs and feet very dark brown.

Length, 6.5 mm.; width between extremities of suprahumeral horns, 4.6 mm.

Philippine Islands (Walker, Stål); LUZON, Mount Banahao (*Baker*).

Tricentrus pilinervosus Funkh. Plate II, fig. 11, *a* and *b*.

> *Tricentrus pilinervosus* FUNKH., Journ. Ent. & Zool. (1914), 6, 68, figs. 2 and 2a.

A black, stout species with rather widespreading, elevated suprahumeral horns. Near *T. decoratus* Dist., but differing particularly in the shape and position of the posterior process. Veins of tegmina very hairy.

Black, densely and coarsely punctate, sparsely pilose. Suprahumeral horns extending upward, outward, and slightly backward, as seen from above rounded before and almost straight behind. Posterior process narrow, acute, carinate, extending beyond internal angle of tegmina. Tegmina fuscous hyaline, base black and punctate, costal and apical margin clouded; veins each bearing two rows of short bristly hairs. Undersurface of body black. Legs dark ferruginous.

Length, including tegmina, 6 to 7 mm.; width between extremities of horns, 3.5 to 4 mm.

LUZON, Los Baños (*Baker*).

Tricentrus plicatus sp. nov. Plate II, fig. 12, *a* and *b*.

Near *T. fairmairei* Stål, but larger and different in color, in the form of the posterior process, the wrinkled condition of the tegmina, and the shape and position of the suprahumeral horns.

Black, punctured, pubescent; pronotum convex, lateral angles prominent, suprahumeral horns very slender, posterior process gradually acuminate, extending beyond internal angle of tegmina; tegmina smoky hyaline, much wrinkled, black and punctate at base.

Head wider than long, black, finely punctate, very densely pilose with yellow hairs; eyes large, reddish brown, extending beyond lateral margin of pronotum at base of head; ocelli opaque brown, almost equidistant from each other and from the eyes and situated slightly above a line passing through center of eyes; clypeus extending for half its length below the line of the face, sharply emarginate at base, lower margin slightly turned out at edge. Pronotum moderately convex, almost perpendicular above head, rounded between horns, black, finely and densely punctate, thickly pilose with long golden hairs; dorsal carina obsolete before horns, percurrent behind them; humeral angles prominent and auriculate; suprahumeral horns arising from extreme dorsolateral margin of pronotum, very thin as seen from the front, distance between their bases almost twice as great as length of horn, horns extending strongly outward, upward, and backward, short, acute, somewhat flattened dorsoventrally, upper surface of horn bearing distinct central carina; scutellum distinct, longer than broad; posterior process slender, triquetrous, slightly depressed in middle, lateral margin extended before middle, tip acute, reaching well beyond internal angle of tegmina. Tegmina smoky hyaline, without markings, base black and punctate, entire surface much wrinkled, veins distinct and somewhat punctate along margins with occasional scattered hairs. Undersurface of body black, sides of abdomen and of meso- and metathorax densely pubescent. Femora brown-black and swollen; hind trochanters armed with strong teeth on inner surface; tibiæ flattened, flavous above, very light yellow below, margins bristled; small yellow nodule in joint between femur and tibia; tarsi ferruginous; claws brown. Type, female.

The type specimen bears Baker's duplicate No. 3116.

Length to extremity of tegmen, 7 mm.; width between extremities of suprahumeral horns, 4.8 mm.

MINDANAO, Dapitan (*Baker*).

Tricentrus attenuatus sp. nov. Plate II, fig. 13, *a* and *b*.

Near *T. gibbosulus* Walk., but different in color, in shape and position of suprahumeral horns, and in structure of posterior process.

Testaceous, becoming light brown posteriorly, broad white tomentose patch on sides of meso- and metathorax; suprahumeral horns broad and flattened, not extending outward as far as humeral angles below them; posterior process short, sharp, tectiform, barely reaching the internal angles of tegmina; undersurface of body black; bases of femora very dark brown; extremities of femora, entire tibiæ, tarsi, and claws ferruginous-ochraceous. Size small.

Head broader than long, almost black, very densely and evenly pilose with silvery hairs; eyes large, very prominent, ochraceous, mottled with brown; ocelli pearly, somewhat farther from each other than from the eyes and situated slightly above a line passing through center of eyes; lower margin of face wavy; clypeus extending well below lower margin of face. Pronotum moderately convex, dark brown before shading to lighter behind, uniformly pilose, finely punctate; humeral angles prominent; suprahumeral horns short, sharp, flattened dorsoventrally, not extending outward as far as extremities of humeral angles, projecting outward, upward, and strongly curving backward, anterior margin broadly rounded, posterior margin almost straight, not carinate above; posterior process tectiform, sharply carinate above, impinging on inner margin of tegmina for entire length below, reaching barely to internal angle of tegmina. Tegmina fuscous hyaline, slightly wrinkled, base dark brown and punctate, veins distinct and brown, narrow brown fascia at extreme exterior tip. Sides of meso- and metathorax directly behind eyes covered with snowy white tomentose patch. Undersurface of body black, slightly pubescent. Femora very dark brown, except extremities which are ferruginous; internal margin of hind trochanters strongly armed with teeth, tibiæ simple and ferruginous; tarsi and claws yellow-ferruginous. Type, male.

Length, 4.5 mm.; width between extremities of horns, 1.9 mm.

MINDANAO, Butuan (*Baker*).

Genus CENTROTUS Fabricius

The advisability of giving the genus *Centrotus* a place in this study is extremely doubtful. It is included entirely on the strength of the descriptions of three species from the Philippines which have been assigned to this genus but which have never been recognized since their original publication.

The genus is one of the oldest and best known of the genera of the Membracidæ, being established by Fabricius in his Systema Rhyngotorum in 1803, and has contained at various times a large number of species now removed to other genera. It appears probable that the species here given will be likewise removed if they are discovered, since the characters of *Centrotus* are much less inclusive than formerly.

The genus as now limited may be recognized by the shape of the posterior process which is distinctly separate and somewhat remote from the scutellum, somewhat extended and widened beneath, then rather abruptly becoming slender, the tip often touching the tegmina. No spines are present on the hind trochanters; the hind wings have three apical areas; the suprahumeral horns are always well developed.

The following must be considered as lost species until examination of type material or careful study of long series of specimens makes their recognition possible.

Centrotus magellani Fairm.

Centrotus magellani FAIRM., Rev. Memb. (1846), 512; WALK., List Hom. Brit. Mus. (1851), 604.

A translation of Fairmaire's original description is as follows:

12. *C. Magellani.**—Lefebv. Coll. Manilla. Long. 0,006. (Fuscous, elytra

hyaline, base and apex punctate black, anterior horns reversed, compressed, recurved.)

Body and prothorax brown; horns compressed, directed forward, their extremities recurved; posterior spine shorter than abdomen; sides of breast white; on the front of the prothorax two lines between the horns and the head of an indistinct gray; legs ferruginous, knees clearer; elytra hyaline, with a brown spot at the base and at the extremity.

Centrotus dilatatus Walk.

Centrotus dilatatus WALK., List Hom. Brit. Mus. (1851), 630.

Centrotus dilatatus was described from a single specimen of which the head was missing. The description lacks the details necessary for present generic determination and is as follows:

Brown, clothed with dingy tawny hairs; head wanting; fore-chest very broad, indistinctly ridged, low in front; shoulders flat, conical, very prominent; horns above compressed, angular, extremely short; hind appendage very short, triangular, keeled, impressed on each side near the base, not extending much beyond the base of the abdomen; fore-wings grayish, ferruginous at the base; veins ferruginous, nodose. Length of the body 1½ line; of the wings 3 lines.

a. Philippine Islands. From Mr. Cuming's collection.

It should be noted that the length of the wings as given above was used by Walker to refer to the distance between the tips of the tegmina when spread at right angles to the body. The measurements as changed to millimeters then become: Length, 3.16 mm.; width of outstretched wings, 6.33 mm.

The description suggests a small *Tricentrus*, but since the recognition of genera and species in this group depends largely on the shape of the clypeus, the relative position of the ocelli and the eyes, the apical areas of the hindwings, and the structure of the scutellum the description of a headless specimen in the discussion of which neither the scutellum nor the hindwings are mentioned lends itself poorly to purposes of identification.

Centrotus orcus Buckt.

Centrotus orcus BUCKT., Mon. Memb. (1903), 247, Pl. 60, figs. 7, 7a, 7b.

No data concerning *Centrotus orcus* are available, except Buckton's description which is here quoted verbatim:

General form robust and broad between the shoulders. Suprahumerals short, connate and stout. Pronotum narrowed to a short almost stylate posterior horn. Colour sordid olive-green, with ochreous tips to the tegmina. Frons and metopidium hirsute. Legs olive. Tegmina with five distinct apical and three discoidal areas.

Size, 5 x 3 mm. Habitat—Philippine Isles.

Genus SIPYLUS Stål

Centrotus FABR. (in part).

Sipylus is a genus peculiar in having the body very broadly triangular, the width between the humeral angles being usually as great as the extreme length of the pronotum. The other characters assigned by Stål to the genus may be deduced from his key[21] to be as follows: Posterior process present; tibiæ simple; sides of breast unarmed; hindwings with three apical areas; posterior process not distant from scutellum; body obtriangular; suprahumeral horns absent; lateral angles prominent; posterior process short and depressed; posterior trochanters armed with spines on internal margin.

The genus is very distinct in general appearance and not difficult to recognize. Only two species, both from the Philippines, have been assigned to the genus. These may be separated as follows:

Key to the species of Sipylus.

*a*¹. Veins of tegmina without prominent nodules................................ crassulus.
*a*². Veins of tegmina with prominent nodules................................ nodipennis.

Sipylus crassulus Stål. Plate II, fig. 14.

Centrotus crassulus STÅL, Freg. Eug. Resa, Ins. (1859), 285.
Sipylus crassulus STÅL, Analect. Hem. (1866), 387. STÅL, Hem. Phil. (1870), 728. BUCKT., Mon. Memb. (1903), 270.

If I am determining *S. crassulus* correctly, it is somewhat variable in size and coloration, and the sexes differ in the length of the auricular humeral angles and in the appearance of the tegmina.

The female is ferruginous brown, punctate, and covered with fine, white, silky pubescence; the humeral angles are very long, almost half as long as the distance between their bases; the pronotum is very convex; the posterior process short, robust, and suddenly acute; the tegmina is smoky, ferruginous, and semiopaque, and more or less wrinkled and with brown punctate base; the legs and undersurface of body are ferruginous.

Length, 5 to 6 mm.; width, 4.5 to 5 mm.

In the male the color is much darker, almost black anteriorly; humeral angles shorter; tegmina almost clear hyaline with black base and white tomentose patch at base of abdomen showing through; undersurface of body black; legs dark brown.

Length, 4 to 5 mm.; width, 3.5 to 4 mm.

Philippines (Stål); LUZON, Mount Banahao (*Baker*).

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[21] Hem. Afr. (1866), 4, 88.

Sipylus nodipennis Funkh. Plate II, fig. 15.

Sipylus nodipennis FUNKH., Journ. Ent. & Zool. (1914), 6, 72, fig. 5.

Sipylus nodipennis is easily recognized by the nodules on the veins of the tegmina and the thick yellow pubescence over the whole surface of the body.

The body is subtriangular; the pronotum slightly wider between the humeral angles than the distance from the anterior convexity to the extremity of the posterior process. The tegmina are broad, rounded at apex, subhyaline and punctate at base, and characterized by the presence of the tubercles on the veins. The posterior trochanters are strongly armed with teeth.

Length, female, 3.5 to 4 mm.; male, 3 mm.; width at humeral angles, female, 3.5 mm.; male, 2.75 mm.

LUZON, Los Baños (*Baker*).

Genus CENTROTOSCELUS Funkhouser

The genus *Centrotoscelus* was erected[22] for the reception of its one species. This genus is peculiar in having no suprahumeral horns and yet having strong teeth on the posterior trochanters. It is entirely distinct from *Sipylus*, though falling near it in an artificial key. The genus seems naturally closely related to *Tricentrus*, from which it may be distinguished by the absence of the suprahumeral horns.

The body is long and comparatively slender; scutellum distinct; posterior process short, impinging on scutellum and tegmina; hind wings with three apical areas.

Centrotoscelus typus Funkh. Plate II, fig. 16, *a* and *b*.

Centrotoscelus typus FUNKH., Journ. Ent. & Zool. (1914), 6, 73, figs. 3 and 4.

Ferruginous brown; pronotum finely and densely punctate and sparsely pilose. Posterior process long, narrow, gradually acuminate, slightly depressed at tip, extending somewhat beyond internal angles of tegmina; median ridge distinct at apex, but becoming obsolete at metopidium. Tegmina subhyaline, brown and punctate at base, a very narrow brown transverse stripe behind middle and a faint brown cloud at apex. Legs ferruginous; tarsi yellowish; claws black. Segments of abdomen margined with white above.

Length, female, 5 mm.; male, 4.33 mm.; width, female, 2.5 mm.; male, 2.2 mm.

LUZON, Los Baños (*Baker*).

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[22] *Journ. Ent. & Zool.* (1914), 6, 72.

Genus EBHUL Distant

Centrotus FABR. (in part); *Leptobelus* STÅL (in part).

The genus *Ebhul* was erected by Distant,[23] with *E. varius* Walk. as the type, to include those species of the division *Gargararia* in which the posterior pronotal process is strongly, sinuately waved.

Other generic characters given by the author are the convexly gibbous, strongly ridged pronotum, the scutellum which is almost as broad as long, the face longitudinally sulcate with the beak reaching the posterior coxæ, and the broad, ample tegmina crossed by a series of transverse veins at its apical area.

To this genus must be assigned the following new species:

Ebhul carinatus sp. nov. Plate II, fig. 17, *a* and *b*.

Ferruginous and black, distinctly marked, punctate, pubescent; anterior pronotum high, entire pronotum sharply carinate; posterior process uniform in size from base to apex, strongly sinuate, extending beyond internal angle of tegmina; tegmina strikingly marked with black, brown, white, and hyaline; undersurface of body almost black; legs ferruginous.

Head including clypeus much longer than wide, center of base much higher than upper margin of eyes, very finely and obsoletely punctate, densely pubescent with white hairs; eyes large, prominent, brown mottled with black; ocelli pearly, semitransparent, much farther from each other than from the eyes and situated about on an imaginary line passing through center of eyes; clypeus set off by distinct suture from head, extending far below the lower margin of the face, subtriangular at base, rather narrow for the rest of its length and truncate at apex. Pronotum rising high above head, finely punctate and pubescent with white hairs, dorsal carina high, sharp, and percurrent; on each side above humeral angles a short, sharp, elevated carina suggesting the beginning of suprahumeral horns; lateral angles prominent; no suprahumeral horns; scutellum distinct, exposed by the elevation of the posterior process above it; posterior process uniform in size, brown at base, white in middle and black at extremity, a deep depression just behind crest of pronotum, another just behind apex of scutellum, the lower line following these curves to form decided sinuosities, tip subacute, triquetrous, extending beyond internal angle of tegmina. Tegmina brown, pubescent and punctate at base, this area followed by a tringular black fascia with base next to posterior process, next to this a triangular white area narrowest above, beyond this a second broad, black fascia extending almost to tip, which is subhyaline. Undersurface of body almost black anteriorly with white pubescence; abdomen fuscous ferruginous. Legs simple, ferruginous; tarsi somewhat darker. Type, male.

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[23] Fauna of British India—Rhynchota (1907), 4, 59.

Length, 5 mm.; maximum width, 2 mm.

MINDANAO, Butuan (*Baker*).

Genus **GARGARA** Amyot and Serville

Membracis FABR. (in part); *Centrotus* FABR. (in part); *Oxyrhachis* GERM. (in part); *Smilia* GERM. (in part); *Maerops* BUCKT.

Gargara is the most richly represented, thus far, of all the genera of the Membracidæ found in the Philippines. Twelve species are here recognized and future collecting will doubtless yield many more. The genus has a wide range, the type species (*G. genistæ* Fabr.) being found in Europe, while many forms have been recorded from Asia, Africa, and the East Indies.

The species are for the most part small and without the striking pronotal developments so common to the family. From the small size and commonplace appearance of its species the genus was named by its authors[24] from the fancied resemblance to a seed.

The pronotal horns are lacking, the posterior trochanters unarmed, the pronotum usually smooth, and the posterior process straight.

The following key, while based on characters entirely artificial, will, it is believed, enable the student to locate all of the species known to the Islands to date. However, any dichotomous table is more or less unsatisfactory, and the full descriptions must be consulted for final recognition of the species.

Key to the Philippine species of Gargara.

a^1. Pronotum entirely black or very dark.
  b^1. Median dorsal ridge distinct and prominent on anterior pronotum as seen from front.
    c^1. Tips of tegmina hyaline or nearly so .... luconica.
    c^2. Tips of tegmina opaque or concolorous with rest of tegmina. varicolor.
  b^2. Median dorsal ridge not present on anterior pronotum or if present very obsolete and faint.
    c^1. Posterior process extending beyond tip of abdomen; large trifoliate spot on tegmen .... trifoliata.

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[24] Histoire Naturelle des Insectes—Hemiptères (1843), 527.

c^2. Posterior process not reaching tip of abdomen.

d^1. Tegmina entirely hyaline, except small black punctate area at base .... **nigrocarinata.**

d^2. Tegmina more or less colored and opaque.

e^1. Front of head densely, posterior process slightly, pubescent. **nigrofasciata.**

e^2. Front of head not densely, posterior process not at all, pubescent.

f^1. Size very small, apical fourth of tegmina entirely hyaline. **pygmaea.**

f^2. Size larger, apical fourth of tegmina not hyaline.... **patruelis.**

a^2. Pronotum yellow, or very light brown at least in the females.

b^1. Veins of tegmina bearing nodules........ **tuberculata.**

b^2. Veins of tegmina not bearing nodules.

c^1. Tegmina entirely opaque.

d^1. Tegmina uniform yellow........ **luteipennis.**

d^2. Tegmina strongly marked with dark brown and white. **pulchripennis.**

c^2. Tegmina hyaline at least for apical four fifths.

d^1. Head much deflexed; pronotum concolorous or nearly so; tegmina clear .... **brunnea.**

d^2. Head almost perpendicular; pronotum marked with brown and yellow; tegmina iridescent........ **nitidipennis.**

Gargara luconica Fairm.

Membracis luconica FAIRM., Rev. Memb. (1846), 255.
Enchenopa luconica WALK., List Hom. Brit. Mus. (1851), 484.
Gargara luconica STÅL, Hem. Phil. (1870), 728.

A small, black, rather robust species with carinate posterior process and dull, opaque tegmina with hyaline tips.

Head broader than long, black, finely punctate, sparsely pilose with silvery hairs; eyes almost white with brown fascia; ocelli pearly, farther from each other than from the eyes and situated slightly above a line passing through center of eyes; clypeus strongly deflexed and extending far below margin of face. Pronotum uniform black, finely punctate, and sparingly pubescent with silvery hairs; median carina percurrent from head to apex of posterior process; humeral angles not prominent; posterior process sharply carinate, tectiform, extending just beyond internal angle of tegmina. Tegmina opaque, except at tips, which are yellowish hyaline; basal and costal areas black and punctate; veins prominent and bearing scattered silvery hairs. Undersurface of body black; legs very dark ferruginous brown, almost black; tarsi very light brown; claws ferruginous.

Length, 3 mm.; maximum width, 1.7 mm.

Philippine Islands (Fairmaire); NEGROS, Cuernos Mountains; MINDANAO, Dapitan; LUZON, Mount Maquiling (*Baker*).

Gargara pygmaea Walk.

Centrotus pygmaeus WALK., List Hom. Brit. Mus. (1851), 630.
Gargara pygmaea BANKS, Phil. Journ. Sci., Sec. D (1910), 5, 48.

I have seen the material which C. S. Banks determined as *G. pygmaea* and believe this determination to be correct. The specimens do not agree with the original description as well as might be desired in some minor respects, but on the whole they answer Walker's description. The specimens which I have seen, however, are all decidedly black, with only a tinge of brown or ferruginous around the anterior and ventral regions, while the original description would have them brown.

This species is very near *G. luconica* Fairm., as I determine that species, but is smaller, and the tegmina are shining black and not dull opaque. In both species the tips of the tegmina are more or less hyaline.

The specimens bear Professor Baker's duplicate Nos. 3951 and 2656.

Very small, black, and shining; posterior process straight and sharp; tegmina glistening black for basal four fifths with tips hyaline.

Head about as long as wide, finely and densely punctate, not pubescent; eyes red-brown; ocelli very small, much farther from each other than from the eyes and situated above a line passing through center of eyes; front of head not greatly deflexed, almost perpendicular, front convex; clypeus extending below margin of face. Pronotum strongly sloping backward from head, black, finely punctate, very sparsely pilose; median dorsal carina distinct behind humeral angles, but obsolete and only obscurely visible before them; humeral angles not prominent; posterior process subtriquetrous hardly reaching internal angle of tegmina. Tegmina glistening, very dark brown or black for basal four fifths, apex hyaline; base black and punctate; veins prominent. Legs and undersurface of body black; tarsi flavous.

Length, 2.5 mm.; maximum width, 1.2 mm.

Philippine Islands (Walker, Banks); PALAWAN, Puerto Princesa; LUZON, Mount Banahao (*Baker*).

Gargara patruelis Stål.

Centrotus patruelis STÅL, Freg. Eug. Resa, Ins. (1859), 285.
Gargara patruelis STÅL, Hem. Phil. (1870), 728.

Rather large, black, robust, without percurrent dorsal carina. Tegmina translucent smoky ferruginous with base and large part of costal area black and punctured. Posterior process strong, sharp, somewhat decurved.

Head wider than long, black, sparingly pubescent with golden hairs; eyes mottled brown; ocelli pearly, not prominent, farther from each other than from the eyes and situated above a line passing through center of eyes; clypeus short, wider than long, continuing irregularly the sinuate outline of the face. Pronotum black, punctate, sparsely pilose, sloping gradually backward above the head; lateral angles obtuse, not prominent; posterior process strong, gradually acuminate, decurved and turning downward at tip, tip extending beyond internal angles of tegmina. Tegmina smoky hyaline, except the black and punctate base which extends down into the costal area; veins prominent, slightly elevated, and brown. Undersurface of body black. Femora and tibiæ black; tarsi flavous.

Length, 4 mm.; maximum width, 2 mm.

Philippine Islands (Stål); LUZON, Malinao, Tayabas, Mount Banahao (*Baker*).

Gargara varicolor Stål. Plate II, fig. 18.

Gargara varicolor STÅL, Hem. Phil. (1870), 728; FUNKH., Journ. Ent. & Zool. (1914), 6, 69.

Gargara varicolor is closely related to *G. patruelis*, but is smaller and differs particularly in the presence of a strong anterior ridge extending over the metopidium and in the markings of the tegmina. The species, as I determine it, varies considerably in size and color, but the tegminal markings appear to be constant. Stål recognizes three varieties, "a," "b," and "c"—the first with pronotum black; the second black with median and lateral stripe; the third ferruginous with black spots on posterior process. Of these I have seen only the first, but in the specimens at hand the color ranges from black to light ferruginous.

Stål describes the tegmina as "vitreis, pone medium fascia fuscescente notatis, pone fasciam subvinaceis, basi punctulatis," and I find an apparently trustworthy character in the fact that the fuscous marking extends into the black punctate base in a wedge-shaped tooth.

The pronotum is sparingly pubescent with yellowish hairs and is very densely and finely punctate. The posterior process is somewhat depressed in the middle and at the tip.

Gargara varicolor seems to be one of the commonest of the Philippine membracids, and many specimens have been studied.

Length, 4.5 mm.; maximum width, 2 mm.

Philippine Islands (Stål); LUZON, Los Baños, Mount Maquiling, Mount Banahao (*Baker*).

Gargara pulchripennis Stål.

Gargara pulchripennis STÅL, Hem. Phil. (1870), 729; FUNKH., Journ. Ent. & Zool. (1914), 6, 70.

Gargara pulchripennis may be recognized at once by the beautiful dark brown and white markings of the tegmina. These markings are rather irregular and confluent, but usually show a distinct cross stripe of white near the base, followed by checkered areas of small brown and white patches. The base of the tegmina is ferruginous and pubescent, the tip narrowly dark brown with a white stripe just before it. The entire tegmen is opaque.

The posterior process is rather short, not reaching the interior angle of the tegmina, slightly depressed at base, and bluntly tectiform at tip. The scutellum is very distinct.

Length, 4 mm.; maximum width, 2 mm.

Philippine Islands (Stål); MINDANAO, Butuan; LUZON, Mount Maquiling, Los Baños (*Baker*).

Gargara nigrofasciata Stål.

Gargara nigrofasciata STÅL, Hem. Phil. (1870), 729; FUNKH., Journ. Ent. & Zool. (1914), 6, 70; FUNKH., Journ. N. Y. Ent. Soc. (1914), 22, 235.

Gargara nigrofasciata is apparently variable, showing a gradation in tegminal markings from the broad-striped form described by Stål to specimens in which the stripe is narrowed to a very narrow ferruginous line. There seem to be no specific differences in the series.

Usually the median dorsal carina is obsolete or visible only upon the posterior process. This process is rather thin and very sharp, reaching the internal angle of the tegmina. The pronotum is black, densely punctate, but not pubescent. The eyes are very prominent and reddish.

The description of a single individual would be misleading, owing to the variety of tegminal markings, and since these markings were used as the principal character in erecting the species, a long series must be studied before accurate specific limits can be established.

Length, 3.5 mm.; maximum width, 1.5 mm.

Philippine Islands (Stål); LUZON, Mount Maquiling, Mount Banahao; MINDANAO, Iligan, Dapitan (*Baker*).

Gargara tuberculata Funkh.

Gargara tuberculata FUNKH., Journ. Ent. & Zool. (1914), 6, 70, fig. 6.

Gargara tuberculata may be recognized by the prominent tubercles upon the veins of the tegmina and upon the pronotum.

Entirely lemon yellow with white lines extending over the shoulders. Head yellow. Posterior process set off from thorax by deep notch on each side. Tegmina yellow, opaque; base punctate and pubescent; veins nodulose. Undersurface of body white tomentose. Legs yellow.

Length, 4 to 4.5 mm.; maximum width, 2 to 2.5 mm.

LUZON, Los Baños (*Baker*).

Gargara luteipennis Funkh.

Gargara luteipennis FUNKH., Journ. Ent. & Zool. (1914), 6, 71, fig. 7.

Gargara luteipennis is of about the size of *G. tuberculata* and resembles it in color, but lacks the granules on tegmina and pronotum. The tegmina are very characteristic, being a flat yellow, not shining or glistening, and with broad, well-marked veins.

Entirely light yellow. Pronotum finely punctate, but not pubescent. Posterior process acuminate, extending as far as the internal angles of the tegmina.

Length, 4 mm.; maximum width, 2.5 mm.

LUZON, Los Baños (*Baker*).

The single type specimen of this species bears Professor Baker's duplicate No. 954.

Gargara nitidipennis Funkh.

Gargara nitidipennis FUNKH., Journ. Ent. & Zool. (1914), 6, 71.

The type specimens of *G. nitidipennis* were rather small, the type measuring 3.5 mm. and the allotype 3.33 mm. Material has since been received which includes specimens 5 mm. in length, so that the insect appears to be somewhat variable as to size.

The specific characters, however, are very constant, especially the extremely iridescent tegmina and the brown- and yellow-marked pronotum. The body is yellow with broad brown fasciæ on anterior metopidium and apex of posterior process. The latter is strong and heavy, slightly depressed at tip, and reaching to the internal angles of the tegmina. The undersurface of the body is ferruginous brown, the legs often being lighter.

Length, 3.5 to 5 mm.; maximum width, 1.3 to 2.2 mm.

LUZON, Los Baños, Mount Maquiling, Mount Banahao; MINDANAO, Iligan, Dapitan; Butuan (*Baker*).

Gargara nigrocarinata Funkh.

Gargara nigrocarinata FUNKH., Journ. N. Y. Ent. Soc. (1914), 22, 234, fig. 1.

Gargara nigrocarinata is a small black species, recognizable by the high ridge on the posterior process and the delicate hyaline tegmina with their sharply marked black bases.

The pronotum is finely punctate and bears short, yellowish or silvery hairs; obtusely rounded in front with prominent lateral angles; median carina obsolete before humeral angles, but well developed posteriorly and becoming high and sharp on posterior process. Head longer than wide; eyes prominent, usually reddish in the females and pearly in the males.

Length, 3 to 3.5 mm.; maximum width, 1.5 to 1.8 mm.

LUZON, Los Baños, Mount Maquiling (*Baker*).

Gargara brunnea Funkh.

Gargara brunnea FUNKH., Journ. N. Y. Ent. Soc. (1914), 22, 235, fig. 2.

Robust, brown, punctate, pubescent. Head broader than long, inflexed. Pronotum low and broad anteriorly; humeral angles obtuse; posterior process long, sloping downward, extending slightly beyond internal angles of tegmina, apex carinate. Tegmina opaque hyaline, except at base, which is brown and punctate.

Length, 3.5 to 4 mm.; maximum width, 2 to 2.3 mm.

LUZON, Mount Maquiling (*Baker*).

Gargara trifoliata Funkh. Plate II, fig. 19.

Gargara trifoliata FUNKH., Journ. N. Y. Ent. Soc. (1914), 22, 235, fig. 3.

The largest and most distinct of all the species of this genus hitherto described from the Islands is *Gargara trifoliata*. It should be easily recognized by the large trifoliate white marking on each tegmen and by the very long, decurved posterior process.

Black, punctate, head and anterior pronotum pubescent. Posterior process heavy and strongly tricarinate, extending to a point more than halfway between the internal angle and the tip of the tegmen. Tegmina black for basal two thirds, on this black area the characteristic clover-leaf hyaline spot, apical third orange-yellow, tip bearing brown band.

Length, 8 mm.; maximum width, 4 mm.

LUZON, Mount Maquiling (*Baker*).

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Genus CRYPTASPIDIA Stål

The genus *Cryptaspidia,* although clearly set off from the foregoing by natural characters, is rather hard to delimit by the use of artificial ones. It can best be recognized by its general appearance and differs greatly from *Gargara* in the size of its species and the difference in the structure shown in the pronotal process.

All of the species assigned to the genus are from the Philippines and were described by Stål in his Hemiptera insularum Philippinarum in 1870.

The insects are long-bodied, rather slender, with very thin, convex metopidia and gradually acuminate posterior processes. The tegmina show two discoidal cells, and this character is given by Stål as generic, but is not in itself sufficient. The hind wings have three apical areas, and the posterior trochanters are without spines.

Four species are known and may be separated as follows:

Key to the species of Cryptaspidia.

a^1. Median dorsal carina entirely lacking.. **pubera.**
a^2. Median dorsal carina visible although sometimes faint.
  b^1. Size small, not over 5 mm. in length.. **tagalica.**
  b^2. Size large, not less than 6 mm. in length.
    c^1. Head strongly convex.. **impressa.**
    c^2. Head not strongly convex.. **obtusiceps.**

Cryptaspidia pubera Stål. Plate II, fig. 20.

Cryptaspidia pubera STÅL, Hem. Phil. (1870), 729; BUCKT., Mon. Memb. (1903), 267; FUNKH., Journ. Ent. & Zool. (1914), 6, 69.

Black, finely and densely punctate, more or less pubescent with flavous hairs. No dorsal carina. Humeral angles obtuse and not prominent. Tegmina ferruginous, somewhat pubescent.

Head entirely covered with matted golden hairs; ocelli pearly, farther from each other than from the eyes, situated above a line passing through center of eyes. Pronotum very convex anteriorly, sparsely pubescent, gradually sloping into posterior process which is rather short, thick, and not carinate. Tegmina rough, somewhat wrinkled, fuscous ferruginous and sparingly pubescent; base black and punctate, this area extending down upon the costal margin. Undersurface of body strongly pubescent. Legs and feet uniformly flavous.

Stål described the tegmina as fuscous hyaline, but in all of the specimens studied they have inclined to opaqueness, especially when seen against the hind wing and abdomen.

Length, 5.5 mm.; maximum width, 2.7 mm.

Philippine Islands (Stål); LUZON, Los Baños, Mount Maquiling (*Baker*).

Cryptaspidia tagalica Stål.

Cryptaspidia tagalica STÅL, Hem. Phil. (1870), 729; FUNKH., Journ. Ent. & Zool. (1914), 6, 69.

Cryptaspidia tagalica is the smallest species of the genus thus far described. The specimens studied agree well in size and color and vary only slightly in tegminal markings.

Black, coarsely and densely punctate, the punctures being much larger and farther apart on the posterior process than on the metopidium. Head somewhat broader than long, punctate, pilose with long yellowish hairs; ocelli distinct, transparent, much farther from each other than from the eyes and situated well above a line passing through center of eyes; clypeus broader than long, only slightly deflexed, pilose; anterior margin of head rounded between the eyes. Pronotum almost perpendicular above the head, very obtusely convex, sparingly pilose over lateral angles; lateral angles rounded, not prominent; posterior process not set off from anterior pronotum by a hollowing out above scutellum, but continuing to a gradual point from the humeral angles, apex acute, very slightly depressed. Tegmina wine-colored, base black and punctate, a rather narrow fuscous band across middle, another near tip, apex hyaline. Undersurface of body and femora black; tibiæ and tarsi ferruginous.

Length, 4.5 mm.; maximum width, 2 mm.

Philippine Islands (Stål); LUZON, Los Baños, Mount Maquiling (*Baker*).

I have seen specimens close to this species, but apparently distinct, which I would not care to describe as new from the limited material. It may be that the species varies more greatly than the above diagnosis would imply.

Cryptaspidia impressa Stål.

Cryptaspidia impressa STÅL, Hem. Phil. (1870), 730; BUCKT., Mon. Memb. (1903), 267.

Cryptaspidia impressa is very close to *C. pubera*, but is larger and shows a distinct carina on the posterior process.

Black, punctate, and pubescent with grayish hairs. Head broader than long, very convex between the eyes, pubescent; ocelli opalescent, farther from each other than from the eyes; eyes prominent; clypeus strongly pilose. Pronotum rounded anteriorly with faint median carina on metopidium which be-comes strong and sharp on posterior process. Tegmina fuscous hyaline, marked with more or less irregular fascia of ferruginous.

Length, 6 to 7 mm.; maximum width, 3 to 3.5 mm.

Philippine Islands (Stål).

Cryptaspidia obtusiceps Stål.

Cryptaspidia obtusiceps Stål, Hem. Phil. (1870), 730.

Cryptaspidia obtusiceps is known to me only from the original description, which follows. It is apparently very close to *C. impressa* and is to be distinguished chiefly by the less convex head as suggested in the key. Stål describes it after *C. impressa* as follows:

> Praecedenti simillima et maxime affinis, differt capite anterius inter oculos sensim obtuse rotundato, fronte obtusissima, deorsum haud prominula. ♀ Long. 6-7, lat. 3-3½ mill.

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ILLUSTRATIONS

PLATE I

FIG. 1. *Centrochares horrificus* Westw.
2. *Pyrgonota bifoliata* Westw.
3. *Pyrgonota pinguiturris* sp. nov.
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6. *Leptocentrus reponens* Walk., *a*, frontal outline; *b*, lateral outline.
7. *Emphusis bakeri* sp. nov., *a*, frontal outline; *b*, lateral outline.
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17. *Ebhul carinatus* sp. nov., *a*, frontal outline; *b*, lateral outline.
18. *Gargara varicolor* Stål.
19. *Gargara trifoliata* Funkh.
20. Tegmen of *Cryptaspidia pubera* Stål.

TEXT FIGURES

FIG. 1. Fore and hind wings of *Tricentrus fairmairei* Stål. *a*, discoidal cells; *b*, apical cells; *c*, internal angle.
2. Front and lateral outline of *Tricentrus fairmairei* Stål. *a*, humeral angles; *b*, suprahumeral horns; *c*, metopidium; *d*, clypeus, *e*, posterior process.
3. Armed posterior trochanters.

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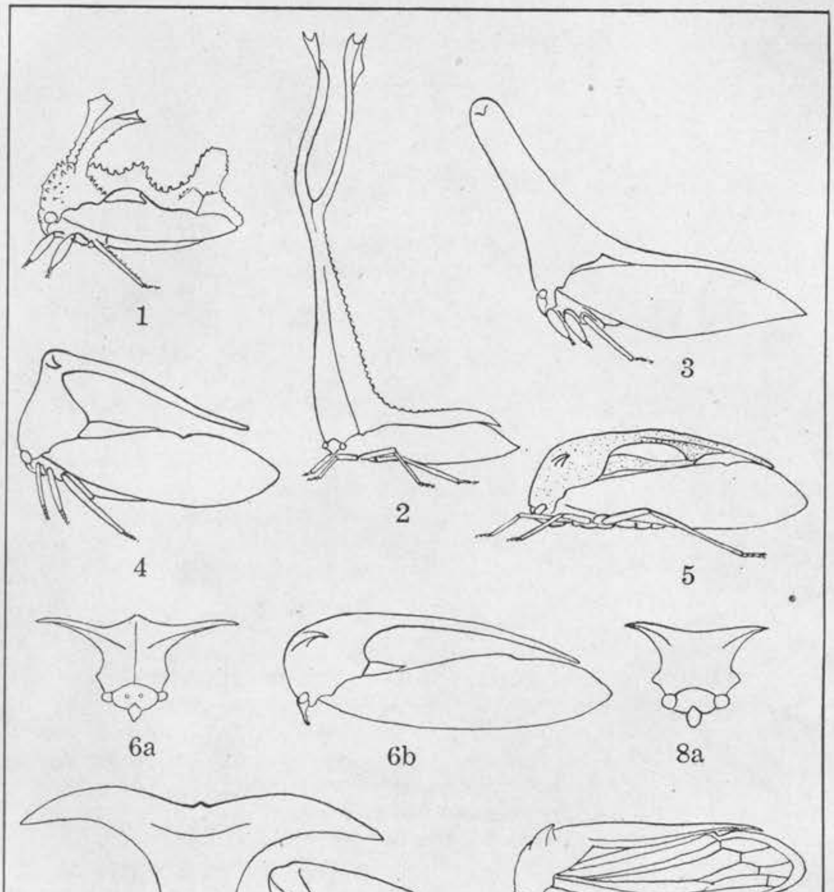
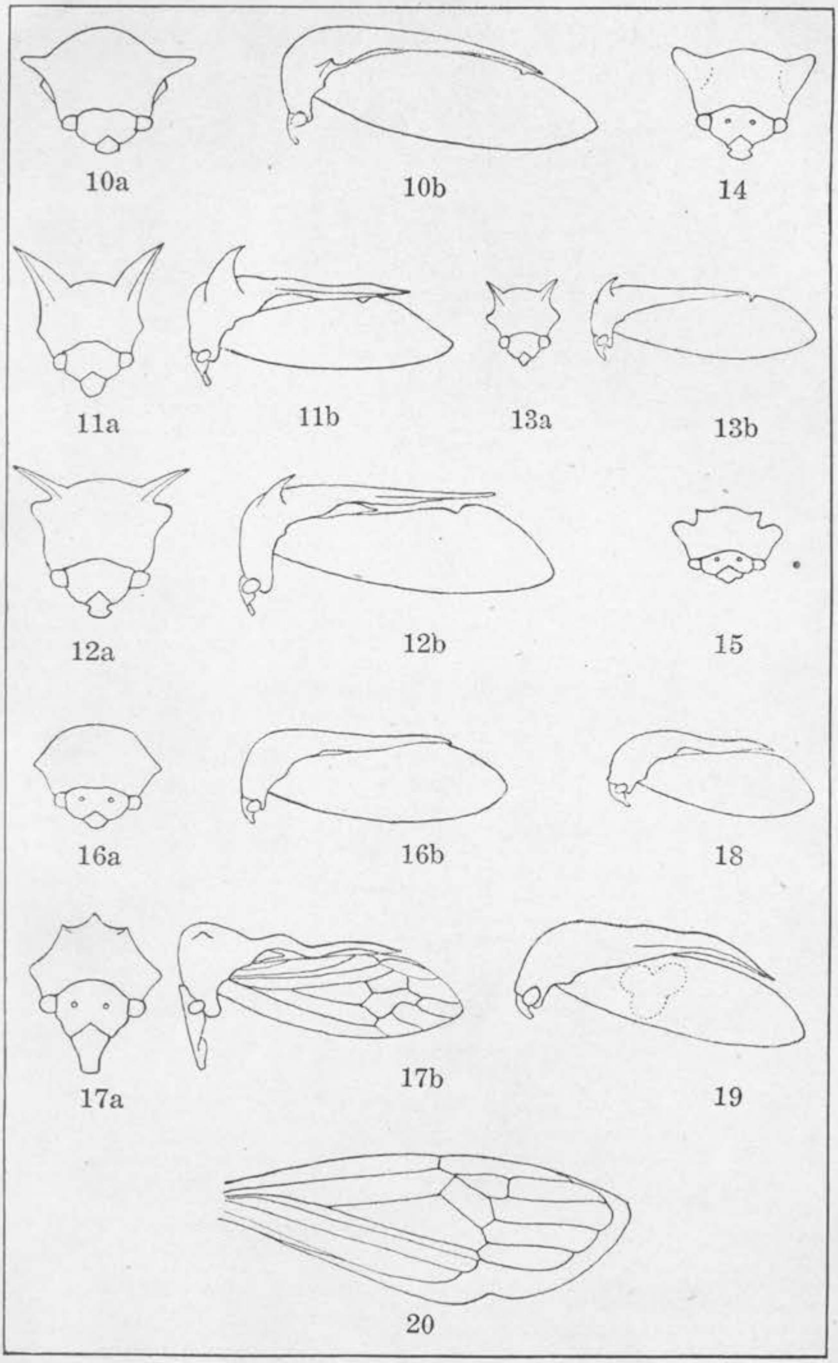


PLATE I. PHILIPPINE MEMBRACIDÆ.



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